DISSERTATION ON

"A STUDY TO ASSESS **THE EFFECTIVENESS OF ICE COLD APPLICATION ON SWELLING** PRIOR TO PLASTER OF PARIS MANAGEMENT IN ACUTE MUSCULOSKELETAL INJURIES AMONG CLIENTS ADMITTED IN EMERGENCY ORTHOPAEDIC AND TRAUMATOLOGY WARD AT RAJIVGANDHI GOVERNMENT GENERAL HOSPITAL, CHENNAI."

M.Sc (NURSING) DEGREE EXAMINATION

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In Partial fulfilment of requirement for the degree of

MASTER OF SCIENCE IN NURSING

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CERTIFICATE

This to certify that this dissertation titled **"**A study to assess the **effectiveness of ice cold application on swelling prior to plaster of paris management in acute musculoskeletal injuries** among clients admitted in Emergency Orthopaedic Traumatology ward at Rajiv Gandhi Government General Hospital, Chennai." is a bonafied work done by **Mrs. P. ANITHA, M.Sc(N),II-Year student,** College of Nursing, Madras Medical College,Chennai-03 and submitted to The Tamilnadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the University rules and regulations towards the award of the degree of Master of Science in Nursing Branch- I, Medical Surgical Nursing under our guidance and supervision during the academic period, 2014 – 2016.

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DISSERTATION ON

"A study to assess the **effectiveness of ice cold application on swelling prior to plaster of paris management in acute musculoskeletal injuries** among clients admitted in Emergency orthopaedic and Traumatology ward at Rajivgandhi government general hospital, Chennai."

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LIST OF ABBREVIATIONS

S.NO	ABBREVIATION	EXPANSION
1.	NO	Number
2.	FIG	Figure
3.	POP	Plaster of Paris
	RGGH	Rajiv Gandhi Government General Hospital
4.	Sd	Standard Deviation
5.	P	Probability
6.		

ABSTRACT

Research Title

"A study to assess **the effectiveness of ice cold application on swelling** prior to plaster of paris management in acute musculoskeletal injuries among clients admitted in Emergency Orthopaedic and Traumatology ward at Rajiv Gandhi Government General Hospital, Chennai."

The musculoskeletal system provides form, support, stability, and movement to the body. The current statistical data shows that in India 22% of people daily affected with acute musculoskeletal injuries and more over 37.5% of Orthopaedic treatment modalities have been affected with uncontrolled inflammatory swelling prior the modalities. Cryotherapy or Ice cold application is one of the best practices to relieve acute swelling, pain and control of further complications. Whole Body Cryotherapy has been extensively researched for its phenomenal benefits towards many inflammatory and auto immune diseases, especially Bone injuries and disorders.

Objectives

1. To assess the level of swelling among clients with acute musculoskeletal injuries in the control and experimental group.
2. To assess the effectiveness of ice cold application in acute musculoskeletal injured clients in experimental group.
3. To assess the effectiveness of ice cold application in acute musculoskeletal injured clients by comparing control group and experimental group.
4. To find out the association between the levels of swelling in acute musculoskeletal injured clients with selected variables in the control and experimental group.

Research methodology

Research design

True experimental study design

Sampling technique

Simple random sampling technique, purposive method.

Data analysis

Data analysed with inferential descriptive statistics.

Discussion

60 samples were collected by simple random technique method. Pre intervention assessment of swelling was done with Inch-tape scale for both experimental and control group with 30 samples in each group.

Ice-cold application was applied for 25-30 minutes for the experimental group. Ongoing assessment was done after each application. Post intervention assessment was done for both experimental and control group. Swelling score in experimental group was 4.02 before administration of Ice-cold application, after Ice-cold application reduced to 1.37 after administration of Ice-cold application. This shows that the effectiveness of Ice-cold application management is 65.1% whereas in routine therapy it is only 16.9%.. Experimental group benefitted more than control group (65.1 – 16.9=48.2%). This is the net effect of this study.

Summary

The present study assessed the effectiveness of Ice cold application among acute musculoskeletal injured clients admitted in Emergency Orthopedic and Traumatology Ward. The results revealed that Ice cold application had a significant effect on the reduction swelling score which was statistically significant in the experimental group.

Recommondations

- The study can be conducted with other intervention of swelling management to reduce the level of post operative pain.
- The study can be conducted to assess the knowledge and practice of the nurses regarding application of Ice cold application on swelling management.

CHAPTER-I

INTRODUCTION

"Our role is to develop techniques that allow us to provide emergency life-saving procedures to injured clients in an extreme, remote environment without the presence of a physician."

Chris Hadfield

The musculoskeletal system is the combination of the muscular and skeletal systems working together and includes the bones, muscles, tendons and ligaments of the body. The musculoskeletal system provides our bodies with shape, protection of our internal organs and the ability to move.

Every time we sit, stand, walk, jump and talk we're using the musculoskeletal system. Without this system or if it's injured and not able to function properly, our ability to complete these everyday tasks is greatly hindered. Think of someone we know who has broken a bone or torn a muscle, how has it affected them? It's so pathetic condition. So managing musculoskeletal injuries without complication is a challenging one.

There are two kinds of musculoskeletal injuries: acute and chronic. Acute injuries occur suddenly when playing or exercising. Sprained ankles, strained backs, and fractured bones are acute injuries. Signs of an acute injury include:

- Sudden, severe pain
- Swelling
- Not being able to place weight on a leg, knee, ankle, or foot
- An arm, elbow, wrist, hand, or finger that is very tender
- Not being able to move a joint as normal

- Extreme leg or arm weakness
- A bone or joint that is visibly out of place.

The current statistical data shows that globally 39% of people daily affected with acute musculoskeletal injuries and in India it is 22% and more over 37.5% of Orthopaedic treatment modalities have been affected with uncontrolled inflammatory swelling prior the modalities .

A Cardinal responsibility in Nursing is to provide comfort and relieve distress. Therefore one of the non pharmacological methods that can be used to reduce swelling is Ice cold application. The use of cold for reducing swelling and pain is a practice dating from the time of Hippocrates in the 4th century BC. Ice was also used as an anaesthetic agent in middle ages. Cold therapy in the forms of ice bags has been extensively used in athletic training since 1960s. It is thought to act as an anti inflammatory agent by reflex vasoconstriction. When ice applied to the surface of the skin the initial response is vasoconstriction of superficial blood vessels. If skin temperature is sufficiently lowered the cooler temperature stimulates free nerve ending which in turn causes that one. After the short period there follows a vasodilatation due to axon reflex, this phenomenon is called as hunting response.

The effects of ice have been demonstrated in numerous animal models and human studies. Ice reduces tissue temperature, blood flow, pain, and metabolism. Cold seemed to be more effective in limiting swelling and decreasing pain in the short term (immediately after application to 1 week post injury). The use of bags of crushed ice or cold gel packs secured to various anatomical sites with bandaging or elastic wraps is a common observation in locker rooms of athletic facilities everywhere. In this setting, Ice cold application with some degree of concomitant static compression is routinely applied immediately after an acute musculoskeletal injury (e.g., ankle sprain, muscle pull) or as prophylaxis for chronic orthopaedic sports problems (e.g.,

tennis elbow). Indeed, the long held dictum among physical therapists in the management of soft tissue trauma remains protection, rest, ice, compression and elevation. Because cold compression therapy directly addresses the swelling, inflammation and pain associated with these injuries, this modality has been extended to the post-operative management of a variety of orthopaedic procedures (e.g., knee arthroplasty) where surgically-induced tissue damage results in a similar but often more severe set of symptoms.

Because the benefits of cold compression therapy diminish with time, this intervention is thought to be most effective if applied almost immediately after injury or at the conclusion of an operative procedure. Consequently, controlled trials of acute athletic- or trauma-related musculoskeletal injuries have been few, challenging to conduct and the findings difficult to interpret. Thus, treatment remains somewhat empirical and inexact. On the other hand, the operative setting provides a more controlled environment for evaluating the role of cold compression in the management of post-surgical oedema, pain and return to function. As a result, controlled trials have better methodological quality and findings may have improved veracity.

The local application of cold suppresses the metabolic rate of the immediately surrounding soft tissue. This decrease in tissue metabolism is associated with a reduction in enzymatic activity, preventing tissue damage caused by hypoxia. Local hypothermia induces vasoconstriction and lowers microcirculation by more than 60%, an effect that can persist for up to 30 minutes after cessation of cooling. Cold-induced vasoconstriction reduces extravasations of blood into surroundings tissues, local inflammation and oedema production. The amelioration of pain associated with the direct application of cold to injured tissue is, in part, related to the reduction in oedema formation as well as to decreases in motor and sensory nerve conduction.

A reduction in blood flow and swelling also can be achieved with compression by facilitating translocation of oedema away from the site of

injury and toward proximal non compressed tissues where it can be resolved more efficiently by the lymphatic system. Importantly, the addition of cold to compression increases the rate, magnitude and depth of temperature reduction as well as the speed of lymph evacuation.

1.1 NEED FOR THE STUDY:

"The art of medicine consists of amusing the patient, while nature cures the disease."

Voltaire

The current statistical data shows that in India 22% of people daily affected with acute musculoskeletal injuries. Although, great studies have been made in the area of managing acute musculoskeletal injuries, the need for further improvement remains a challenge. clinical studies have found that the faster reduction of oedema before applying a plaster cast , and minimizing the rate of plaster cast complications to the affected client. More over when myself struggled with acute ankle sprain the ice cold application only helped me in reducing the ankle swelling than I experienced with the compression intervention with the crepe bandage. Cold application is a simple and inexpensive therapy which has been accepted for decades as an effective non pharmacologic intervention for oedema and as well as pain management. It reduces the oedema in acute soft tissue injuries by breaking the spasm-vicious-circle and made a reflex vasodilatation on the deep tissues. Cold is commonly used in the treatment of acute soft tissue injuries to relieve pain, but if it given before plaster cast application; it reduces oedema fast and makes the cast so effective.

Table 1.1: Statistics of Acute musculoskeletal injuries admitted in Emergency orthopaedic ward at Rajiv Gandhi Government General Hospital.

Year	Month	Total Number Of Admissions
2015	**March**	**960**
2015	**April**	**1014**
2015	**May**	**1400**
2015	**June**	**1814**
2015	**July**	**2005**

The above table reveals that there is not much decline in the number of Acute musculoskeletal injuries admitted in Emergency orthopaedic ward at RGGH per month.

The investigator was thus provoked to do this study when she was working in the orthopaedic ward. She witnessed that orthopaedic clients were unable to move and also were suffering with severe unbearable pain , swelling even though they were administered with analgesics; the swelling, intolerable pain reduced the comfort of clients and also the care taker. These facts stimulated the investigator to look for the solutions to increase the comfort by adopting nursing measures. The investigator collected sample of review on Ice cold application which is a proven and cost effective method to promote clients comfort and reduce their level of swelling.

Whole Body Cryotherapy has been extensively researched for its phenomenal benefits towards many inflammatory and auto immune diseases, especially Bone injuries and disorders.

1.2 Statement of the problem:

A study to assess the effectiveness of ice cold application on swelling prior to plaster of paris management in acute musculoskeletal injuries among clients admitted in Emergency Orthopaedic and Traumatology ward at Rajiv Gandhi Government General Hospital, Chennai.

1.3 OBJECTIVES:

1. To assess the level of swelling among clients with acute musculoskeletal injuries in the control and experimental group.

2. To assess the effectiveness of ice cold application in acute musculoskeletal injured clients in experimental group.

3. To assess the effectiveness of ice cold application in acute musculoskeletal injured clients by comparing control group and experimental group.

4. To find out the association between the levels of swelling in acute musculoskeletal injured clients with selected variables in the control and experimental group.

1.4 OPERATIONAL DEFINITION:

Acute musculoskeletal injuries

Acute musculoskeletal injuries is the descriptive term that refers to injuries of the muscles, tendons, ligaments, joints, bones, cartilages, inter vertebral discs or other musculoskeletal connective tissues.

Ice cold application

It refers to continuous application of (14-15 crushed ice cubes) covered in polythene bag sealed well and applied 3 cm above the injured site.

Swelling

Swelling is a transient abnormal enlargement of a body part or area not caused by proliferation of cells. It is caused by accumulation of fluid in tissues.

Swelling is considered one of the five characteristics of inflammation along with pain, heat, redness, and loss of function.

Plaster of paris

White powdery substance, used as a base for gypsum plasters and as a material for mixing with water to make fine casts to compress on the area of broken bone.

Effect

Defined as the significant reduction of swelling measure by a Scale.

1.5 ASSUMPTION:

Clients will express their satisfaction with reduced swelling and pain prior to the plaster cast management.

1.6 HYPOTHESIS:

H1- There is significant effect in reduction of swelling after ice cold application in acute musculoskeletal injured clients.

H2- There is significant difference in the level of swelling among control and Experimental group.

1.7 DELIMITATIONS:

The study is limited to acute musculoskeletal injured clients who got admitted in emergency orthopaedic ward.

The period of data collection is 1 month.

CHAPTER-II

REVIEW OF LITERATURE

"We love comfort, and people make a lot of money selling us comfort, but I would challenge the notion that comfort is usually good for us"

Daniel E Lieberman

The purpose of Review of Literature is the identification, selection, critical analysis and reporting of existing information on the problem chosen for the study.

Review of literature helps to know what is already known and helps in developing a broad conceptual content in to which the research problem will fit in. Main goal is to develop a sound study that will contribute to further knowledge in development of nursing theory, education, practice and research.

Good research does not exist in the vacuum. A review of literature provides the current theoretical and scientific knowledge about a particular problem, and resulting in a synthesis of what is known and not known. A through literature review helps the researcher to develop an insight into the area of investigation and directs to develop a plan of action.

Literature review related to the study

2.1 Literatures related to Ice cold application

2.2 Literatures related to Ice cold application in acute musculoskeletal injuries

2.1 Literatures related to Ice cold application

Daniel A. Martinez, MA, DC, Research Scientist, Parker College of Chiropractic Research Institute, (2010) Cold therapy can be used to control pain and oedema. Cold cannot reverse oedema once it has developed, however, if applied soon enough after injury can prevent it from occurring. Cold diminishes secondary hypoxic injury, so there is less free protein in the tissues

decreasing the tissue oncotic pressure leading to tissue swelling. This is done in two ways: by decreasing metabolism and by lowering permeability. Decreased metabolism results in decreased secondary hypoxic injury and therefore less tissue debris. With less tissue debris, there is less free protein and a lower oncontic tissue pressure. It should be noted that there is some confusion concerning oedema and inflammation. Oedema is a sign of inflammation and using ice to control it is helpful, however, cold can also diminish the inflammatory response if used to try to remove the swelling once it has occurred and is not recommended for this use. Cold has an analgesic effect for musculoskeletal pain although the mechanism is not well understood. Studies have shown that cold has an effect on nerve conduction velocity and can raise pain threshold and tolerance. Another important effect of cold application is decreased metabolism. Cold reduces cellular energy needs reducing the tissue requirements for oxygen. A body temperature kept at a subnormal level will require less blood. A lower metabolism will give an injured organ a better chance at survival. Cold therapy has been used in reduction of muscle spasm. Pain can lead to reflex muscular spasm, which are neurological in origin involving both gamma and alpha motor neurons. Cold applications help decrease gamma motor spasm and pain which allows the muscle to relax.

Greenstein GUniversity of Medicine and Dentistry of New Jersey, Newark, NJ, USA, **(2013)** To inhibit signs of inflammation and achieve beneficial results with cryotherapy, skin temperature (normally 33 degrees C) needs to be reduced to 10 degrees C to 15 degrees C. Cold therapy usually decreased skin temperature to 10 degrees C to 15 degrees C within 10 to 20 minutes. Physiological studies indicated cryotherapy resulted in vasoconstriction, reduction of oedema, and diminished pain perception. Various methods can be used to lower tissue temperature. Ice or gel packs are easy and efficient techniques to cool tissues. Seven studies published in English were found that addressed the use of cryotherapy after oral surgical procedures. Five investigations demonstrated no clinical benefits from cold therapy, and two studies indicated that cryotherapy reduced post-surgical edema and pain. The time interval for cold applications varied in different studies (10 minutes to continuous for hours). There seemed to be consensus among clinicians that cryotherapy should be applied for 10 to 20 minutes followed by a rest period. Ice applied after surgical procedures may reduce swelling and discomfort.

Clin Exp Rheumatol. 2010 May-Jun;24(3):295-301, Sixty clients with active seropositive RA were recruited in a randomised controlled single-blinded study to receive whole-body cryotherapy at -110 degrees C, whole-body cryotherapy at -60 degrees C, application of local cold air at -30 degrees C and the use of cold packs locally. In the final analysis, the last 2 groups were pooled. The clients had 2-3 cryotherapy sessions daily for one week plus conventional physiotherapy. Clinical and laboratory variables and patient's and physician's global assessments were used to assess the outcome. Swelling decreased in all treatment groups, most markedly in the whole-body cryotherapy (-110 degrees C) group. DAS decreased slightly with no statistically significant differences between the groups. No serious or permanent adverse effects were detected. Six of 40 clients (15%) discontinued the whole-body cryotherapy.

Emily E. Williams, ATC, and Giampietro L. Vairo, PhD, ATC,**(2010)** Studies suggest cryo therapeutic agents can reach tissues at a depth of approximately 1 to 3 inches5 and that their analgesic effect can be expedited or heightened by the common practice of applying concomitant compression with an elastic bandage or plastic wrap. However, current evidence suggests the depth of penetration, which is dependent on the type of cold modality used, varies from 1 to 3 cm,8-10 overlying adipose and related tissue composition and thickness factors may also contribute.

UNGARO, A. (2010) Pilates. London; Dorling KindersleyLtd, cryotherapy is a physical medicine and rehabilitation therapeutic agent commonly used by different clinicians in a variety of practical settings. The targeted therapeutic effect of this modality, an analgesic response, occurs as the result of afferent sensory information being relayed more slowly to the central nervous system. Although such a biophysical mechanism may raise concerns about potential detrimental effects on proprioception and neuromuscular control, evidence suggests such outcomes may be dependent on injury status as well as the

specific structure or tissue being treated. Regarding the latter, cryotherapy applied to a joint, regardless of whether concomitant compression is used, may not necessarily result in the type of balance and physical performance deficits that have been demonstrated in applications involving muscle. This suggests that practices such as cryotherapy before physical activity may potentially be used without diminishing performance capacity or heightening susceptibility to injury in healthy individuals; however, this may not be true with applications to muscles, in which cryotherapy has been shown to elicit proprioception and neuromuscular control impairments that UNGARO, A. (2002) *Pilates.* London; Dorling KindersleyLtd increased with the use of concomitant compression. This hypothesis requires thorough study and may not currently pertain to populations suffering from neuromusculoskeletal injury or dysfunction.

Emine Kol (2010) Conducted a study to Evaluate the Outcomes of Ice Application for the Control of Pain Associated with Chest Tube Irritation. The randomized and single-blinded study consisted of 40 clients (20 in the control and 20 in the study group) who underwent Thoracotomy with chest tube placement. Standard postoperative analgesic methods were applied to all clients. Additionally, ice (in flexible and bendable cold gel packs wrapped in fine cloth sheaths) was applied to the chest tube insertion site at the 24th, 28th, 36th, and 40th postoperative hours for 20 minutes. Average pain severity scores during the mobilization activities, including coughing and walking, were compared and found to be significantly lower in the study group clients who received cold therapy than in the control group clients (p <.05). The application of ice to the chest tube insertion site reduced pain associated with irritation along with the need for analgesics.

Marzieh Hasanpour, etal (2009) Purpose of this study was to assess the effect of local cold therapy and distraction in pain relief using penicillin intramuscular injection in children. In this work, 90 children with ages from 5 to 12 who had penicillin injection intramuscularly in a health centre were studied the data was collected through interview and questionnaire. Oucher

scale was used to measure pain intensity. Average pain intensity in local cold therapy, distraction, and control groups was 26.3, 34.3, and 83.3, respectively. The findings indicate that pain intensity was significantly higher in the control group than the experimental groups. This study supports the efficacy of non pharmacologic pain management methods in children. Nurses are recommended to use local cold therapy and distraction to decrease pain intensity of penicillin intramuscular injection in 5–12-year-old children.

Chou SY, Liu HE (2008) conducted a study on Comparison of effectiveness adopting a quasi- experimental design in which moist and dry Cryotherapy in reducing discomfort after orthognathic surgery. The purpose of this study was to compare the effectiveness between ice towel (moist cryotherapy) and ice pack (dry cryotherapy) in postoperative care. Orthognathic surgery is often performed to modify the facial appearance of individuals. The study involved data collection at the preoperative, postoperative 60, 90, 120, 180, minutes, 24hours and 48 hours. Both moist and dry Cryotherapy reduced postoperative discomfort effectively. The moist cryotherapy was more effective in reducing subjective discomfort caused by the
operation. The dry Cryotherapy reduced local temperature more effectively in certain areas after surgery.

SabithaP.B, etal (2008) reported study to assess the effectiveness of Cryotherapy on ArterioVenous fistula puncture related pain in Hemodialysis clients. A convenience sample of 60 clients (30 each in experimental and control group) by using randomized control trial objective and subjective pain scoring was done for two consecutive days with cryotherapy for the experimental and without Cryotherapy for the control group. The objective ArterioVenous fistula puncture pain score on days 1and 2 of Hemodialysis clients on experimental group was found to be significantly reduced (P=0.001) so they concluded that Cryotherapy is effective in reducing ArterioVenous fistula puncture pain of Hemodialysis clients.

Amin A Algafly, Keith P George (2007) Conducted a study on the effect of cryotherapy on nerve conduction velocity, pain threshold and pain tolerance. A within-subject experimental design; treatment ankle (cryotherapy) and control ankle (no cryotherapy). A convenience sample of adult male sports players was included in the study. In the control ankle, Nerve Conduction Velocity, Pain Threshold and Pain tolerance did not alter when reassessed. In the ankle receiving cryotherapy, Nerve Conduction Velocity was significantly and progressively reduced 10 ($p<0.05$). Cryotherapy led to an increased Pain Threshold and Pain Tolerance ($p<0.05$).

East C.E, Begg L (2007) Conducted a study on local cooling for relieving pain after perineal surgery in which seven studies including 159 women were compared cooling treatments such as ice, cold gel pads, or cold bath with no treatment, or other treatments. One study found that women reported less pain 24 to 72 hours after giving birth when they used the ice packs, rather than when they had no treatment. There is only a small amount of evidence of how safe and effective cooling treatments are used to relieve perineal pain.

Ali Fakhr Movahedi, etal (2006) The purpose of the study was to determine the effect of local refrigeration prior to venipuncture on pain-related responses in school-age children a Quasi-experimental study. The samples were 80 children 6 to 12 years of age selected by purposive sampling In the test group, the injection site was refrigerated for three minutes using an ice bag. In the control group, the procedure was performed according to usual routine. The results of this study suggest that the use of local refrigeration prior to venipuncture can be considered an easy and effective intervention of reducing venipuncture-related pain.

Finan, et al (2006) conducted a study to assess the effectiveness of Cryotherapy on post operative pain in gynaecologic clients undergoing

laparotomy (n=20) experimental group consists of 13 clients. All clients underwent exploratory laparotomy. ,and received post operative pain relief with intravenously administered analgesics. Data were analyzed by descriptive and inferential statistic (P<0.05). The results show that the Cryotherapy reduces the post operative pain in gynaecological clients undergoing laparotomy.

Laureauo, Filho., et al (2005) reported the effectiveness of Cryotherapy on reduction of pain, swelling and trismus after third molar extraction n=14 with the age group of 20 to 28 years. The sample consists of eleven women and three men. The authors extracted two mandibular third molars at different times from each patient, immediately after surgery, the patient underwent cryotherapy on one side for 30 minutes, every one and one half hours for 48 hours when he or she was awake. The patient did not receive Cryotherapy on the other side. The authors performed clinical examinations to measure trismus and swelling before surgery, immediately after surgery and 24 and 48 hrs after surgery. Overall they found significant differences between the control and treated sides (P=<0.05) Cryotherapy was effective in reducing post operative swelling and pain.

2.2 Literatures related to swelling in acute musculoskeletal injuries

Jill stein(2011) conducted a study on clients with anterior crucial ligament reconstruction 36 clients were assigned for comprehensive cryotherapy three times daily for at least 30 minutes per session. All clients were given the same standard post operative rehabilitation protocol clients returned to the clinic for at 1, 2, and 6 weeks after the procedure for routine care. The study found that the VAS score decreased significantly from 54.9 at baseline to 28.1 by 6 weeks.

Li Fang, et al(2011) conducted a prospective double blinded quasi experimental study to examine 'The Effects of cryotherapy in relieving Anterior Crucial Ligament Tear swelling', the aim of the study was to examine

whether the application of cryotherapy with ice in a plastic bag is effective in reducing the severity of swelling. 59 clients were assigned to receive cryotherapy (experimental group 33 people) and without cryotherapy(control group 26 clients). Experimental group received three 10 minutes series of ice packing over a three hour period with 50 minutes interval. The swelling score of the experimental group decreased from 5.12-1.82 after cryotherapy, while the swelling score in the control group decreased from 4.04- 2.88.

Wojtecka-Lukasik E, et al(2010) conducted a study on RA clients and showed that ice-cold application significantly reduced ($P < 0.001$) histamine levels in the blood of clients with RA. The effect was long-lasting (for at least 3 months). The levels of blood histamine in clients with OA were not changed significantly. Cryotherapy also down regulated the respiratory burst of PMNs and NAHase activity and up regulated calprotectin levels and the activity of NTPPHase. However, these changes were not statistically significant. In contrast, there were no significant changes in histamine levels or the other biochemical parameters measured in groups of clients treated only with physiotherapy and kinesitherapy. It may be concluded that the beneficial clinical effects of cryotherapy in RA clients are in part due to the action on the production, release, or degradation of histamine.

Herinchih.H, et al (2009) conducted a study on continous local pooling for Inflammation relief followed by total hip Arthroplasty among 40 clients. Samples were randomnly assigned in 2 groups Cryotherapy was given 1-4 days following surgery, after that Inflammation score was assessed by using numerical rating scale. The findings revealed that cryotherapy group Inflammation level is significantly lower than the control group.

Mac Auley DC (2009) conducted on ice therapy: how good is the evidence? Systematic review suggests that melting iced water applied through a wet towel for repeated periods of 10 minutes is most effective. The target temperature is reduction of 10-15 degrees C. Using repeated, rather than continuous, ice

applications helps sustain reduced muscle temperature without compromising the skin and allows the superficial skin temperature to return to normal while deeper muscle temperature remains low. Reflex activity and motor function are impaired following ice treatment so that clients may be more susceptible to injury for up to 30 minutes following ice treatment. It is concluded that ice is effective, but should be applied in repeated application of 10 minutes to be most effective, to avoid side effects, and prevent
possible further injury.

Dale M. Daniel (2008) conducted a study on the effect of cold therapy on pain, swelling, and range of motion after Anterior Cruciate Ligament reconstructive surgery. This prospective study assessed the effect of cold therapy on pain, pain medication use, limb swelling, and knee range of motion in 131 clients who had an Arthroscopically assisted Anterior Cruciate Ligament reconstruction. Clients were randomized into five treatment groups. Cooling pads were incorporated into the dressing in 89 clients, and no cooling pads were used in 42 clients. There were four cooling-pad temperature groups: 40°F, 45°F, 55°F, and 70°F. The cooling pads lowered the skin temperature. There was no difference between groups with respect to hospital stay, pain medication use, pain scale, knee girth, or range of motion.

Richard Eustice, etal (2008) reported a study to assess the effectiveness of Cryotherapy to assess the effectiveness of Cryotherapy on relieving the symptoms of Osteoarthritis by using three randomized controlled trials involving 179 clients with arthritis. The first of the three studies revealed that ice massage for 20 minutes a day, 5 days a week for 2 weeks improved muscle strength in the leg. The second study showed that clients using ice packs for 3 days had no significant improvement in pain. The third study indicated that cold packs applied to the knee for 20minutes, 10 minutes, resulted in decreased swelling compared to the control group. To summarize the ice massage was useful for reducing knee swelling.

Woolf SK (2008) This prospective, randomized study compared postoperative pain control with use of a specific cold therapy regimen which was begun postoperatively and continued for 2 weeks as adjunctive management of postoperative pain. Clients were randomly assigned to a continuous Cryotherapy Follow-up questionnaires were completed on 5 postoperative days these findings support use of continuous temperature-controlled cold therapy devices for night time pain control and improved quality of life in the early period following routine knee arthroscopy.

Bjourn kullenberg, etal (2007) conducted a prospective study to evaluate the effectiveness of cold compression for clients undergoing Total Knee Arthroplasty (TKA) in the Department of Orthopedics, Blekingesjukhuset, Karlshamn Hospital, Sweden, for 86 clients total knee arthroplasty (TKA) was performed to evaluate the role of cold ompression. The clients were treated with cold compression or other drugs for 3 days after TKA. Pain was measured on a visual analog scale, and total consumption of analgesics was recorded. Range of movement (ROM) was recorded before TKA until 3 weeks postoperatively. Weight bearing, blood loss, and time in hospital were recorded. Visual analog scale scores and analgesic consumption were equal in both groups. Range of movement at discharge was 758 in the cold compression group vs 638 in the control group. By 3 weeks' follow-up, ROM was
998 vs 888. Mean Hemoglobin value averaged 120mmol/L in the cold compression group and 109mmol/L in the control group after surgery. Mean time in hospital of clients with cold compression averaged 4.8 days vs 6.2 days in the control group15. The study shows that cold compression therapy improves the control of pain and might thus lead to improvement in ROM and shorter hospital stay.

Mc Donough S.M, et al (2006) reported a study to assess the efficacy of Cryotherapy protocol in the management of Acute Ankle Sprain using

randomized controlled trials. Two treatment groups were selected. Standard ice application n=46 intermittent ice application n =43, one, two, three, four, six weeks after the injury function pain swelling were recorded. Samples treated with the intermittent protocol had significantly($P<0.05$) less ankle pain on activity than those using a standard 20 minute protocol, however one week after ankle injury, there were no significant differences between groups in terms of function , swelling , or pain at rest. Intermittent application may enhance the therapeutic effect of ice in pain relief after
acute soft tissue injury.

Naoto Saito, et al (2006) this study is the first to evaluate whether continuous cryotherapy can relieve pain soon after THA. Clients who had undergone THA for osteoarthritis were divided into 2 prospective, randomized groups: the cryotherapy group was fitted with a computer-controlled cooling device for 4 days, and the control group was not. The pain scores measured on a visual analog scale between days 1 and 4 following surgery were significantly lower for the Cryotherapy group than for the control group. Furthermore, postoperative analgesic use by the Cryotherapy group was significantly lower than by the control group. The results of this study support the potential benefit of a cold compressive device for pain reduction during the postoperative recovery of clients undergoing THA.

Kevin P. Speer, etal (2006) conducted a prospective study to evaluate the efficacy of Cryotherapy in the postoperative anterior shoulder stabilization including 50 clients admitted for at least one night after anterior shoulder stabilization. The clients were randomized: 25 were fitted with a cryotherapy device in the operating room, and 25 were not. Otherwise, postoperative treatment was identical for the two groups, including types of analgesic agents given. The Inflammation scales assessed pain, comfort, sleep, analgesic use, and overall satisfaction.. Those in the cryotherapy group slept better on the night of the operation and used pain medicine less often in comparison with

those in the non Cryotherapy group. By postoperative day 10 ,16 clients in the cryotherapy group reported their shoulders hurt less often and with less severity.

Singh H (2006) open and arthroscopic procedures on the shoulder. Seventy clients were randomly assigned to one of two study groups: (1) continuous cryotherapy group and (2) age-matched control group. Visual analog scales were used to assess subjective responses on postoperative days 1, 7, 14, and 21. On day 1, clients receiving cryotherapy reported significantly less pain during sleep and significantly more comfort and rated their sleep as more restful than the control samples.

Raynor M C, et al (2005) conducted a meta analysis study the combined scientific evidence of studies evaluating the effectiveness of Cryotherapy after Arthroscopically assisted Anterior Cruciate Ligament reconstruction. Electronic databases and bibliographical references of relevant articles were used to identify all relevant randomized clinical trials. Cryotherapy was associated with significantly lower the severity of inflammation (p=.02) this Meta analysis showed that cryotherapy has a statistically significant benefits in inflammation control.

2.3 CONCEPTUAL FRAMEWORK

"A conceptual frame work is the overall under pinning of the study. Conceptual framework is highly valuable on that often serve as the spring board for theory development."

Dennis F Pilot

The conceptual framework for this study is developed by the investigator based on modified Donabedian's model. The focus of this theory is the adaptation of the individual to stimuli, from the environment from within.

Each component has a direct influence on the next, as represented by the arrows in the following schematic (Donabedian, 1980):

Structure refers to the attributes of the settings in which providers deliver health care, including material resources (e.g., electronic health records), human resources and organizational structure.

Process of care denotes what is actually done to the patient in the giving and receiving of care.

Health outcomes are the direct result of a patient's health status as a consequence of contact with the health care system.

In this study, the structure includes the human resource demographic variable and clinical variabls.

Process includes pre-intervention assessment done on the swelling, the treatment or application of ice-cold application in clients with acute musculoskeletal injuries in experimental group. In the process, experimental group receives Ice-cold application whereas control group didn't receive Ice cold application.

The output is reduction in swelling, among the acute musculoskeletal injured clients in the experimental group, and there is no significant change in swelling among control group without ice-cold application.

CHAPTER-III

RESEARCH METHODOLGY

"Research is to see what everybody else has seen, and to think what nobody else has thought."

Albert Szent-Gyorgyi

Research methodology is a way to systematically solve the research problem. It is a science of studying how research is done scientifically. Methodology is a significant part of the research under which the researcher is able to project a blue print of the research undertaken. This chapter includes research approach, research design, variables, setting of the study, population, sample size, sampling technique, development and description of tool, content validity of tool, Pilot study, procedure of data collection and plan for data analysis. The problem stated in this study is on effectiveness of Ice cold application on swelling management among Clients with acute musculoskeletal injury admitted in Emergency Orthopaedic and Traumatology Ward in Rajiv Gandhi Government General Hospital, Chennai-03.

3.1 Research approach

Quantitative approach was used for this study.

3.2 Duration of the study

The study was conducted up to one month.

3.3 Study settings

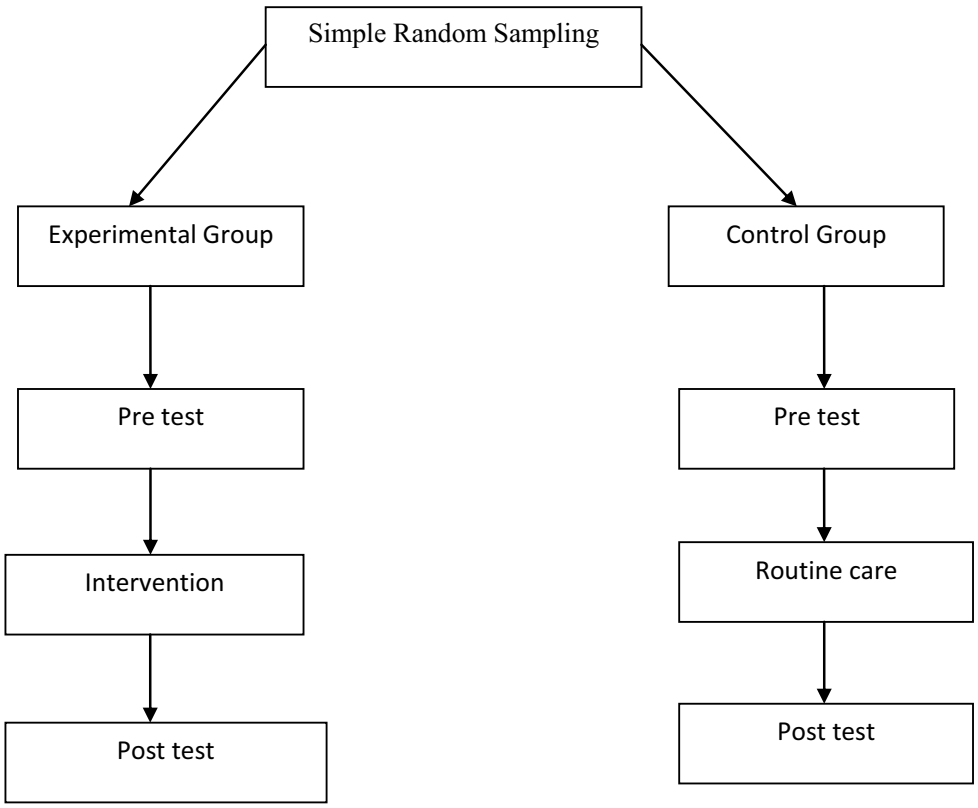
The study conducted in Emergency Orthopedic and Traumatology ward in Rajiv Gandhi Government General Hospital, Madras Medical College, Chennai - 03. It is one of biggest hospital in South East Asia with 3100 + beds and has all specialities and super specialities. The first Orthopedic service in Tamilnadu was started in Rajiv Gandhi Government General Hospital in the

year 1929 initially as an Outpatient service. In the year 1931 inpatient facilities were started. In 1949, a separate Orthopedic department was established by Lt. Col.V.R.Thayumanaswamy who was the first Professor of Orthopedic Surgery. The current bed strength is 500+ in the department of Orthopedic surgery; Government General Hospital is the largest department in a Government Hospital set up in the whole of India. The Director incharge of the institute of Orthopedics is Professor Prof. Deen Mohammed Ismoil. There are totally 4 units in the department. The number of acute musculo skeletal injuries has been on an average of 40-50 per day.

3.4 Study Design

True experimental study design is chosen as appropriate for the study. This design is the most suitable design for the present study because it helps the researcher to experiment the use of Ice cold application on swelling management.

Schematic Diagram



Intervention Protocol

Place	:	Emergency Orthopedic and Traumatology ward, RGGH, Chennai.
Dose	:	14-15 Ice cubes in a tight polythene bag.
Duration	:	20-35 minutes in one or two intervals
Frequency	:	for every 20 minutes/ assessment in every 10 minutes.
Time	:	Admitted acute injuries within 3 hours of injured time.
Administered by	:	The Investigator

3.5 Study Population

The study population consists of acute musculoskeletal injuried clients admitted in Emergency Orthopaedic and Traumatology ward at Rajiv Gandhi Government General Hospital, Chennai-3.

3.6 Sample size

The sample comprises of 60 adult clients who have met acute musculoskeletal injuries, the inclusion criteria 30 clients in control and 30 in experimental group.

3.7 Criteria for Selection of samples

3.7.1. Inclusion criteria

3.7.2. Exclusion criteria

3.7.1. Inclusion criteria

1. Clients who have admitted with acute musculoskeletal injuries.
2. Clients with swelling.
3. Clients who can understand Tamil and English.

3.7.2. Exclusion criteria

1. Clients who have admitted with serious condition.
2. Clients who are all not willing to participate in this study.
3. Clients with Vascular problems and other uncontrolled systemic diseases.
4. Clients who were selected for the pilot study
5. Clients who cannot understand Tamil and English.

3.8 Sampling technique

Data sampling method was done by Simple random sampling technique, purposive method. Those who fulfilled the inclusion criteria, were included in the study. The patient's who are all having acute musculoskeletal injuries and their relatives were approached and explained regarding the study and its purpose. Those consented to participate in the study were chosen.

3.9 Research variables

Independent variable – Ice-Cold application

Dependent variable – Swelling

3.10 Development and description of the tool

Consists of two parts

Section A **:** Demographic and Clinical Variable

Section B **:** Inch-tape measurement

3.10.1 Development of the tool

Tool selected for the measurement of swelling for easy handling of tool and to prevent the inconvenience to the acute

injured Clients Inch tape selected as tool for measuring the swelling in pre test and post test.

3.10.2 *Description of the tool*

A manual tape measure (which looks a little like a long, skinny ribbon or a ruler made out of flexible material) lacks some of the convenient features of a modern retractable tape measure, but with the proper technique, it works just as well. To start taking a measurement, grab the "zero" end and line it up with the start of the object or length you want to measure.

Part of the problem with manual tape measures is that they're most useful for measuring only short differences because we have to be able to hold the zero end in place while we move the other end into position. Thus, most manual tapes won't be much longer than the human arm span.

If we need to measure beyond our reach, we can try keeping the zero end of our tape measure in place with a weight or getting others to help.

3.10.3 Content Validity

The instrument was developed based on the review of literature. Validity of the tool was assessed using content validity. Content validity was determined by experts from Nursing and Medical experts. They suggested certain modifications in the tool. After the modifications they agreed this tool for assessing effectiveness of Ice-cold application among acute musculoskeletal injured clients admitted in Emergency Orthopaedic and Traumatology ward.

3.11 Ethical Considerations

This study was conducted after the approval from ethical committee board from Madras Medical College. Permission was obtained from Professor Deen. Mohammed. Ismoil, The Director of the Institute of Orthopaedics and Traumatology of Rajiv Gandhi Government General Hospital, Chennai – 03.

Before conducting the study an informed consent was obtained from all participants. Confidentiality of the samples information was promised.

3.12 Pilot study

The pilot study is a small version or trial run of the major study which was conducted in the Emergency Orthopaedic and Traumatology ward at Rajiv Gandhi Government General Hospital Chennai -03. The study was conducted for duration of 5days.The important reason for conducting the pilot study was to test the scales for their reliability and validity. A total of 10 clients (5 experimental and 5 controls) that fulfilled the inclusion criteria were included in the study. The study was found to be feasible with regard to time and the availability of samples and cooperation of samples. It also provided information regarding reliability, feasibility of the designed methodology. Necessary changes were made in the tool.

Few changes were made after the pilot study as follows:

Samples were taken from clients with acute musculoskeletal injuries without serious illness due to feasibility as clients with multiple injuries and other complications were not able to cooperate for Ice-cold application.

3.13 Validity and Reliability

After construction of questionnaire for "A study to assess the effectiveness of ice cold application in the reduction of swelling prior to plaster of paris management in acute musculoskeletal injuries among clients admitted in Emergency Orthopaedic and Traumatology ward at Rajiv Gandhi Government General Hospital, Chennai" It was tested for its validity and reliability.

Validity of the tool was assessed using content validity . Content validity was determined by experts form Nursing and Medical. They suggested certain modifications in tool. After the modifications they agreed this tool for evaluate the effectiveness of ice cold application in the reduction of swelling prior to plaster of paris management in acute musculoskeletal injuries among clients admitted in Emergency Orthopedic and Traumatology ward at Rajiv Gandhi Government General Hospital, Chennai.

After pilot study reliability of the tool was assessed by using interrater method and its correlation coefficient r –value was 0.83. This correlation coefficient is very high and it is good tool for evaluate the effectiveness of ice cold application in the reduction of swelling prior to plaster of paris management in acute musculoskeletal injuries among clients admitted in Emergency Orthopaedic and Traumatology ward at Rajiv Gandhi Government General Hospital, Chennai-3

3.14 Data collection procedure

Pre intervention assessment was done for both experimental and control group. Ice-cold application was applied for the experimental group for 25-30 minutes. Post intervention assessment done after 30 minutes. Post intervention assessment was done for both experimental and control group. Swelling observation was recorded using the Inch-tape measurement Scale.

Intervention group

For the intervention group in the, Emergency Orthopaedic and Traumatology ward. Pre intervention assessment was done to the samples respectively. Ice cold application was given 30 minutes in some cases where swelling is more than 5cms 35 minutes given. Gauze spread covered over the swelling site and Ice cold application was given along with routine care and post intervention assessment was done after each application.

Control group

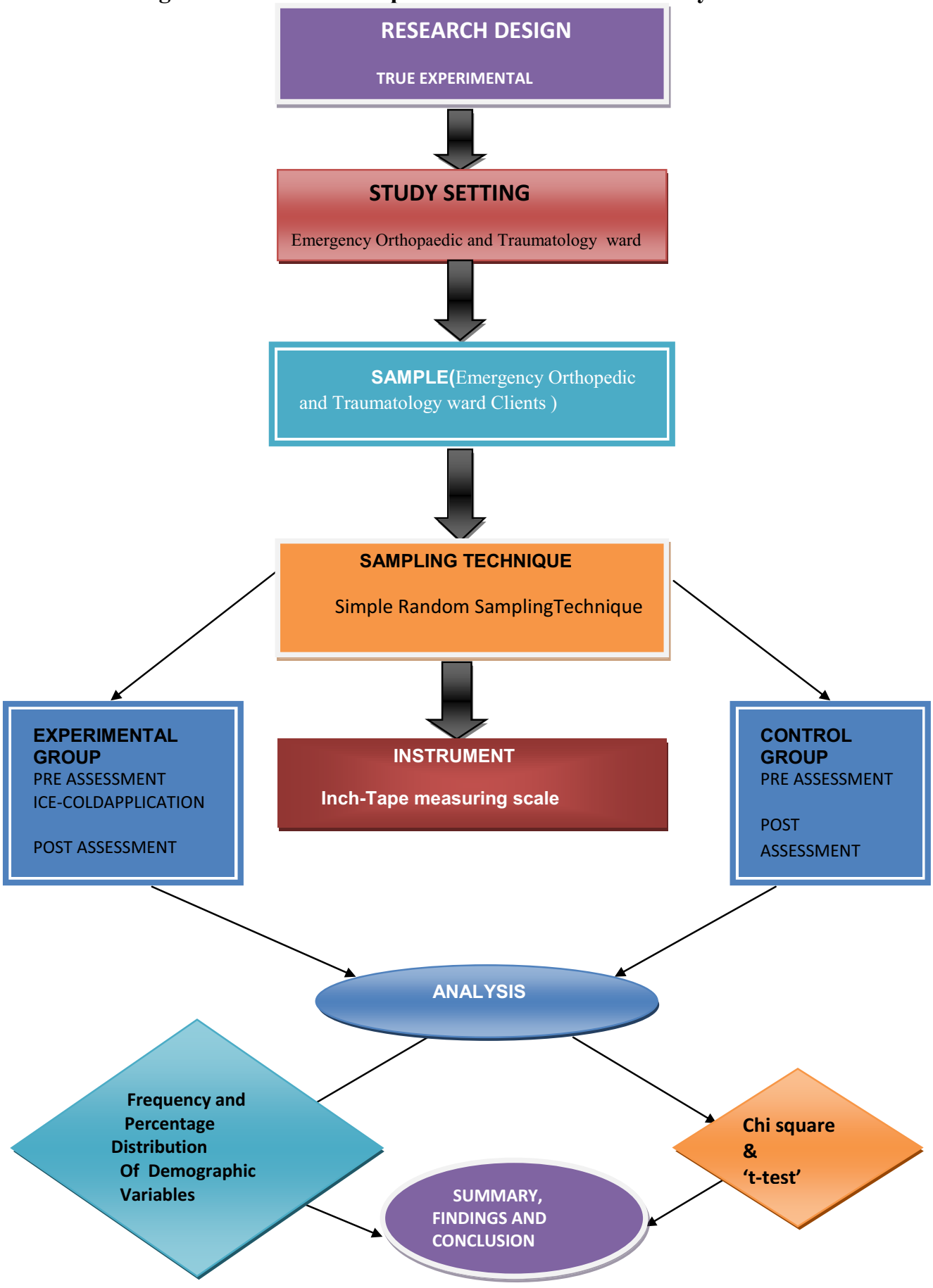
For the control group in the pre intervention in Emergency Orthopaedic and Traumatology ward assessment was done the samples for 30

minutes after admission. Intervention was not provided by the investigator. Assessment was done every for every 10 minutes. The samples received standard treatment and care for the reduction of swelling before plaster of paris application.

3.15 Data entry and analysis

Statistical analysis of data helps in analyzing quantitative information. It helped and enabled to summarize, organize, evaluate, interpret and communicate numerical information. Data were collected and entry made by given coding. Coding data entered in the spread sheet and analysis was started. In this study mean and standard deviation was used to analyze the level of swelling. Association between demographic variables and levels of swelling were analyzed using Pearson chi-square test/Yates corrected chi square test were used to analyze the association between demographic variables and level of swelling. Difference between experiment and control group score were analysed using student's independent t-test. Differences between levels of swelling were used to analyze using Pearson chi-square test. Differences between swelling score was analyzed using student independent t-test. Simple bar diagram, Multiple bar diagram, subdivided bar diagram, line graph, Pie diagram were used to represent the data.

Figure 3.1: schematic representation of research study



CHAPTER-IV

ANALYSIS AND INTERPRETATIION

This chapter deals with the analysis and interpretation of data which was collected from 60 clients (30 experimental and 30 control groups) who had acute musculoskeletal injuries. This study was conducted to determine the effectiveness of Ice-Cold application on swelling management among Clients with acute musculoskeletal injuries admitted in Emergency Orthopaedic and Traumatology ward at Rajiv Gandhi Government General Hospital, Chennai .

The purpose of analysis is to reduce the data to an interpretable form so that the relation of research can be studied. The data collected from acute musculoskeletal injured clients with structured interview schedule was organized, analyzed and interpreted by using descriptive and inferential statistics.

4.1 Organisation of the data

The data has been organized and presented in five section

The data collected was edited, tabulated, interpreted and findings obtained were presented in the form of tables and diagrams represent the following heading.

- Section A : Assessment of Demographic & Clinical Profile
- Section B : Assessment of the pre test level of swelling among experimental and control group.
- Section C : Assessment of the post test level of swelling among experimental and control group.
- Section D : Assessment of the effectiveness of Ice cold application among experimental group.
- Section E : Associate the effectiveness of Ice cold application with selected Demographic and clinical variables.

4.2 Statistical analysis

SECTION A:

Table 4.1: Demographic Profile

Demographic variables		Group				Chi square test
		Experiment		Control		
		n	%	n	%	
Age in years	21 -30 years	12	40.0%	13	43.3%	$\chi 2$=2.49 p=0.47 DF=3 Not significant
	31 -40 years	6	20.0%	2	6.7%	
	41 -50 years	8	26.7%	9	30.0%	
	51 -60 years	4	13.3%	6	20.0%	
Sex	Male	17	56.7%	21	70.0%	$\chi 2$=1.14 p=0.28 DF=1 Not significant
	Female	13	43.3%	9	30.0%	
Education Qualification	Uneducated	5	16.7%	1	3.3%	$\chi 2$=6.67 p=0.08 DF=3 Not significant
	Primary Education	15	50.0%	12	40.0%	
	Higher Secondary	10	33.3%	14	46.7%	
	Graduate	0	0.0%	3	10.0%	
Occupation	Professional	2	6.7%	2	6.7%	$\chi 2$=2.92p=0.40 DF=3 Not significant
	Business	8	26.7%	12	40.0%	
	Skilled Work	1	3.3%	3	10.0%	
	Unemployed	19	63.3%	13	43.3%	
Family Income	< Rs.5000	5	16.7%	4	13.3%	$\chi 2$=1.86 p=0.60 DF=3 Not significant
	Rs.5001 -10000	14	46.7%	10	33.3%	
	Rs.10001 -15000	9	30.0%	14	46.7%	
	> Rs.15000	2	6.7%	2	6.7%	
Religion	Hindu	23	76.7%	27	90.0%	$\chi 2$=2.82 p=0.24 DF=2 Not significant
	Christian	5	16.7%	3	10.0%	
	Muslim	2	6.7%			
Marriage status	Unmarried	12	40.0%	16	53.3%	$\chi 2$=1.07 p=0.30 DF=1 Not significant
	Married	18	60.0%	14	46.7%	
Living place	Urban	23	76.7%	18	60.0%	$\chi 2$=3.75 p=0.15 DF=2 Not significant
	Semi Urban	4	13.3%	3	10.0%	
	Rural	3	10.0%	9	30.0%	
Food Habit	Vegetarian	5	16.7%	4	13.3%	$\chi 2$=0.13 p=0.72 DF=1 Not significant
	Non-Vegetarian	25	83.3%	26	86.7%	

The above table reveals the demographic information of clients those who were participated for the following study on“A study to assess the effectiveness of ice cold application on swelling prior to plaster of paris management in acute musculoskeletal injuries among clients admitted in Emergency Orthopaedic and Traumatology ward at Rajiv Gandhi Government General Hospital, Chennai.”

Considering the demographic variables of both experimental and control groups, they are not significant with the seriousness of injury and effectiveness of Ice-cold application.

The Clients with the age of 21-30 years (40%), 31-40 years (20.0%), 41-50 years(26.7%), 51-60 years(13.3%) in experimental group and in Control group 21-30 years(43.3%),31-40 years(6.7%),41-50 years(30.0%), 51-60 years(20.0%).

Considering the patient’s gender Male clients were 56.7 in experimental and (70%) in control group, female clients (43.3%) in experimental, 30.0% in control group.

Regarding educational status uneducated 16.7%, primary education qualified 50.0%, higher education undergone 33.3% and no graduates in experimental group. In control group they were 3.3%, 40.0%, 46.7%, 10.0% respectively.

In experimental group occupation wise patient’s distribution was professional6.7%, business doing 26.7%, skilled working 3.3%, and unemployed 63.3%. Where as in control group the distribution are 6.7%, 40.0%, 10.0%, 43.3%.

Regarding the family income, in experimental group clients with < 5000 rupees monthly income were 16.7%, Rs 5001-10000 were 46.7%, 10,001-15,000 were 30.0%,and >15,000 rupees were 6.7%. In control group they were 13.3%, 33.3%, 46.7%, 6.7% respectively.

Religion wise distribution in experimental and control group Hindus 76.7% and 90.0%, Christians 16.7% and 10.0% and Muslims 6.7%, no Muslims in control group.

Considering marital status unmarried were 40.0% in experimental 53.3% in control group likewise married 60.0% in experimental and 46.7% in control group.

Regarding place of residence urban living 76.7%, semi urban living 13.3%, and rural living 10.0% in experimental group clients. In control group urban living 60.0%, semi urban living 10.0%, rural living 30.0%.

In experimental group regarding food habit vegetarian 16.7%, non vegetarian 83.3% and in control group they were 13.3%, 86.7% respectively.

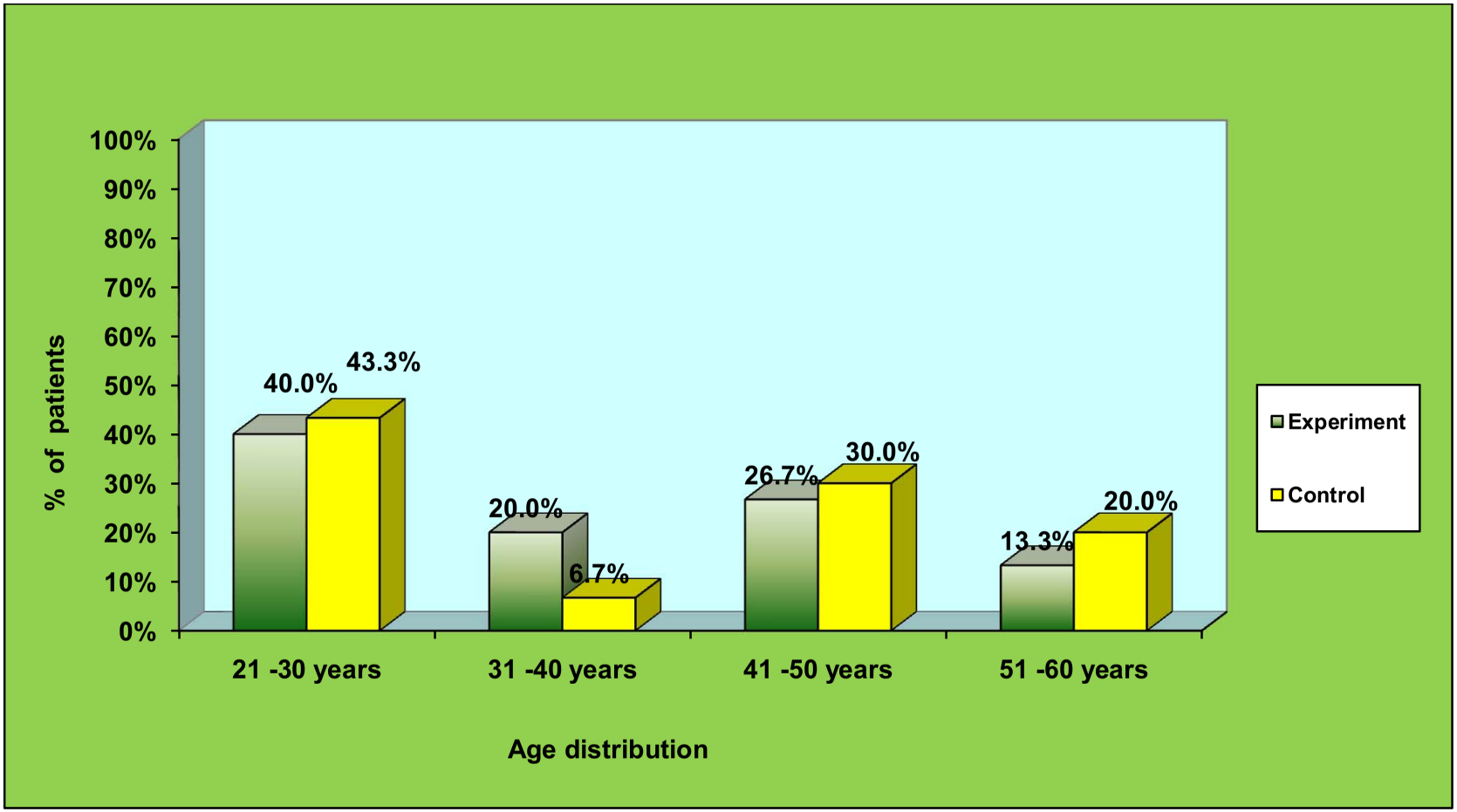


Fig 4.1 Shows age wised distribution

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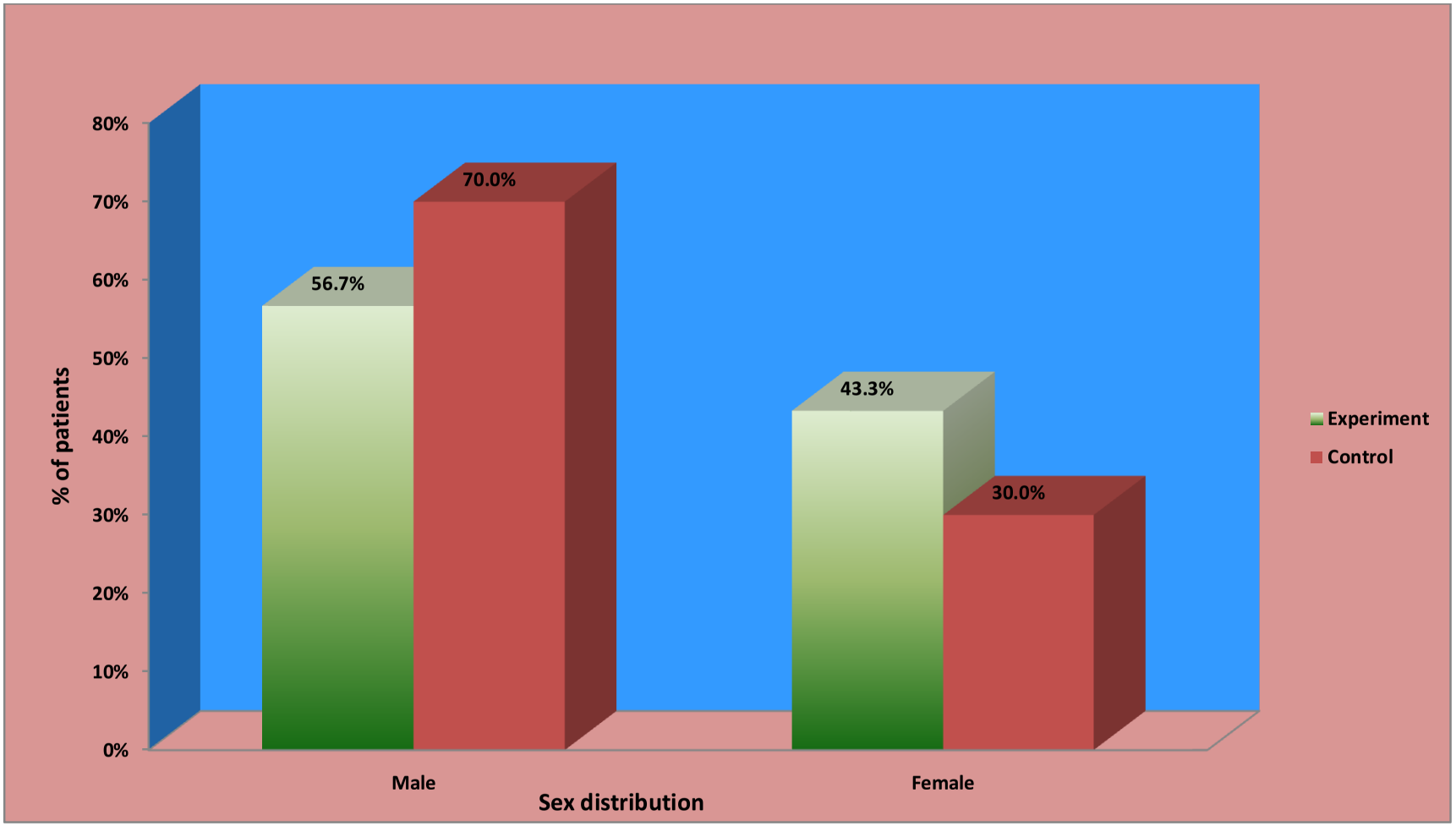

Fig 4.2 Shows gender wised distribution

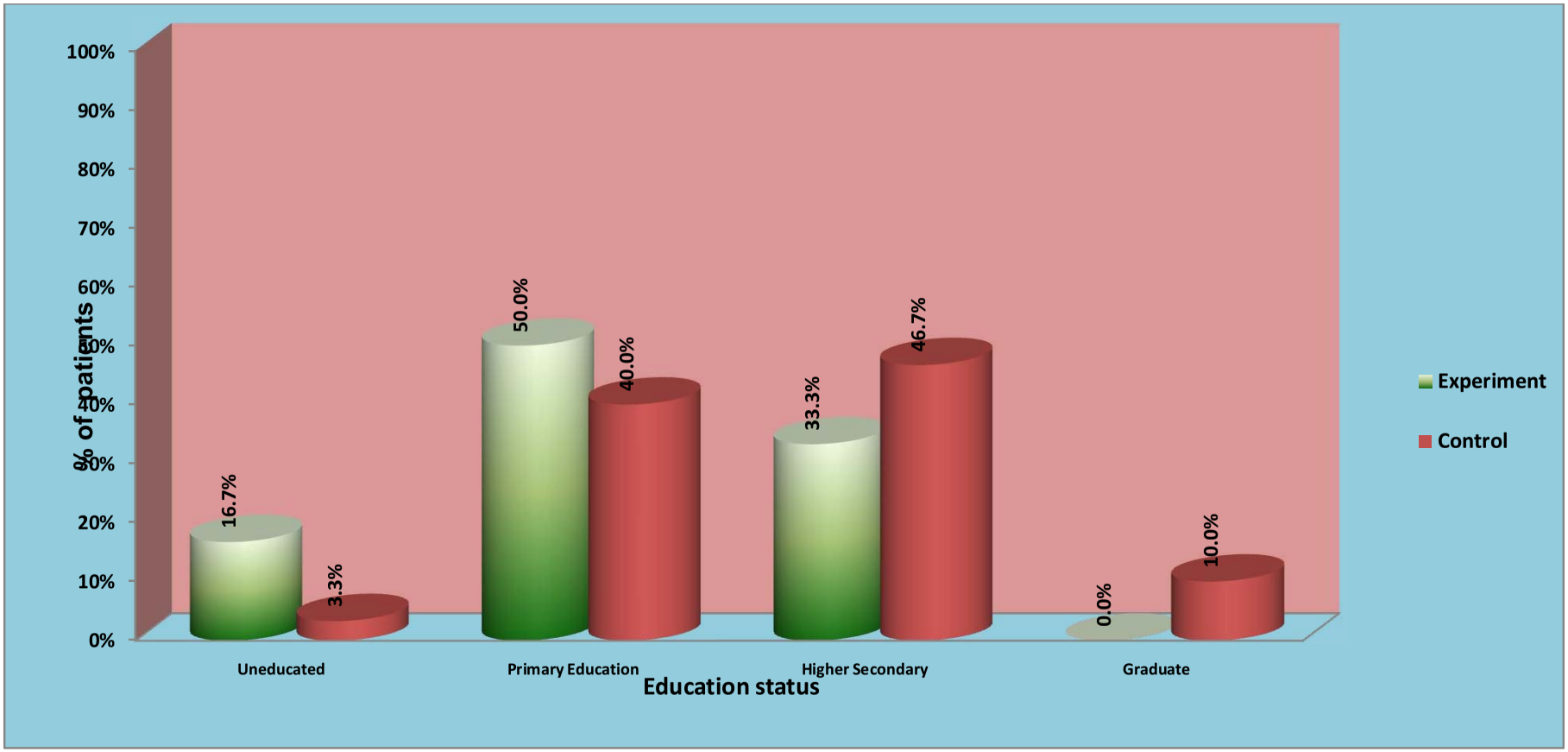

Fig 4.3 Shows the Education status wised distribution

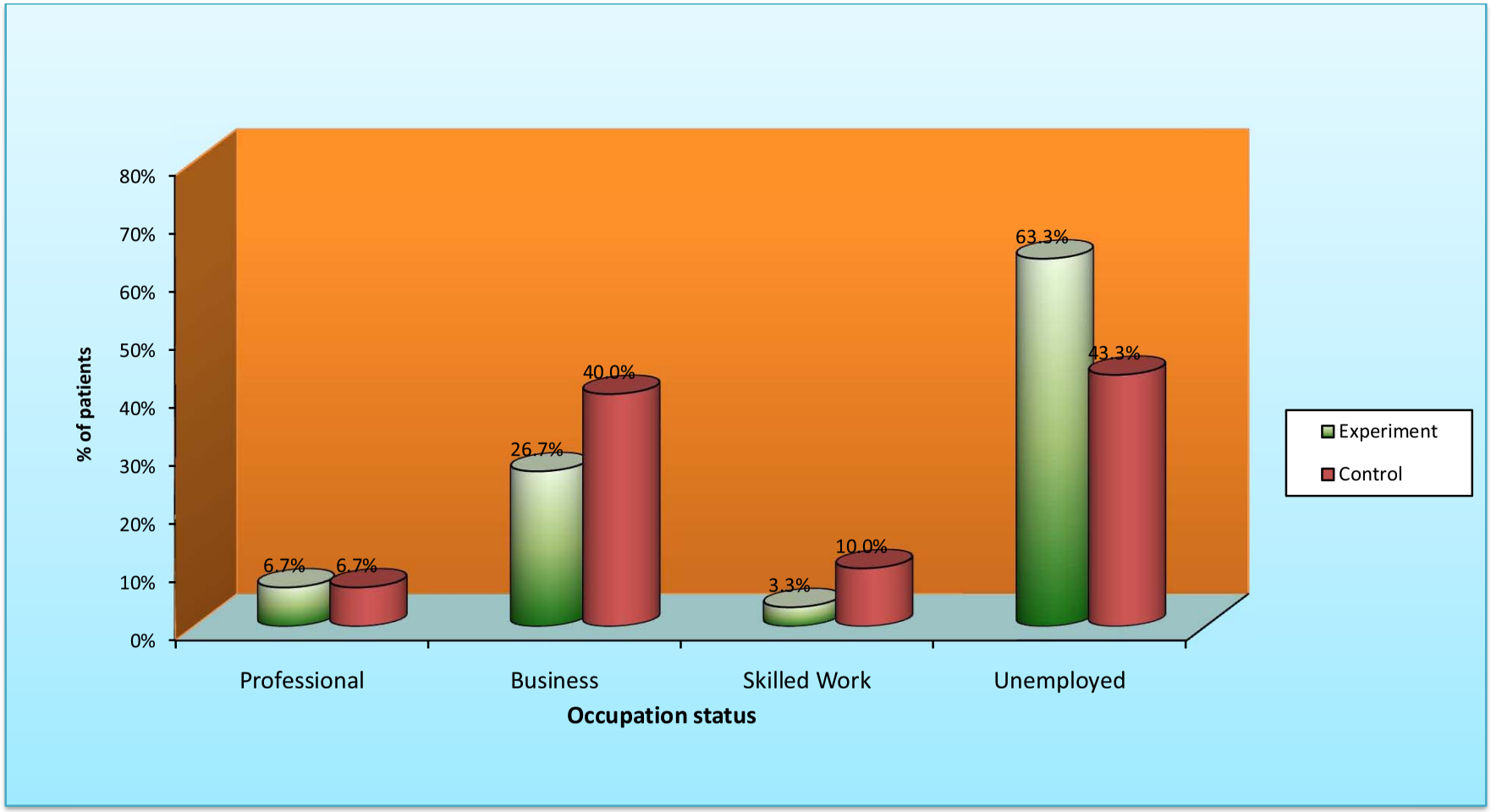

Fig 4.4 Shows the Occupation status wised distribution

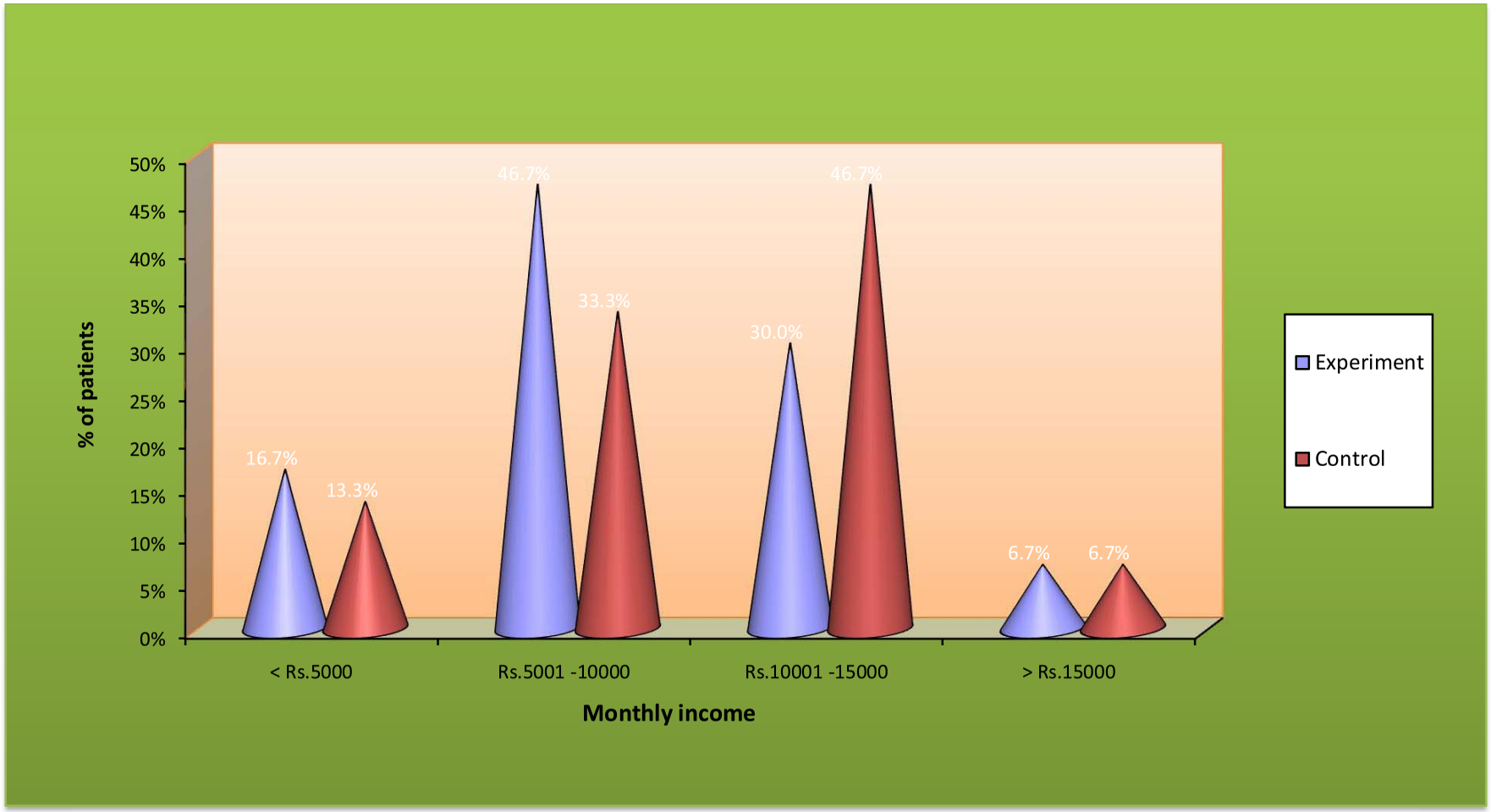

Fig 4.5 Shows income wised distribution.

Fig 4.6 Shows the Place of residence wised distribution

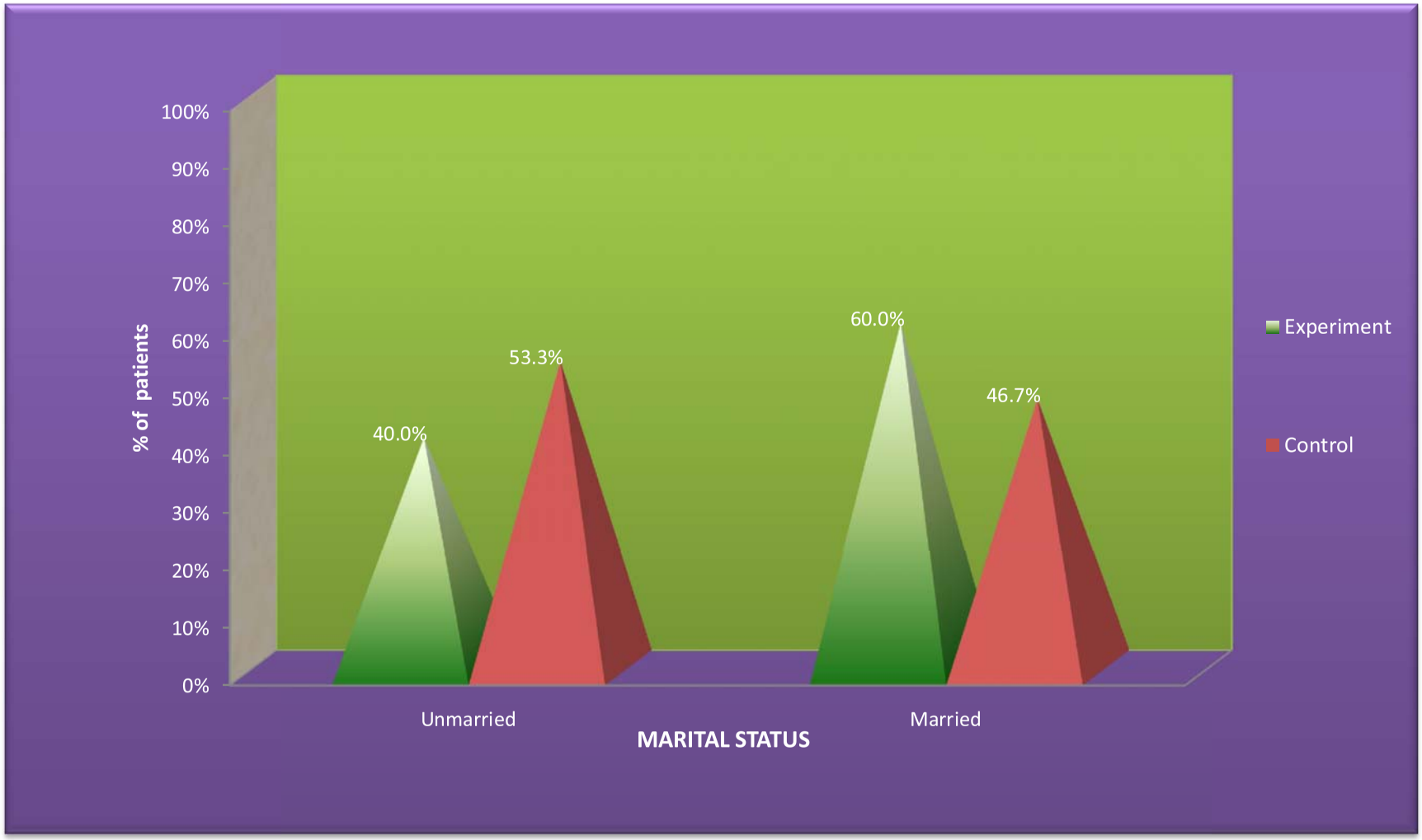

Fig 4.7 shows marital status wised distribution

Table4.2: MEDICAL RELATED INFORMATION

Medical related variables		Group				Chi square test
		Experiment		Control		
		n	%	n	%	
Nature of Injury	RTA	21	70.0%	24	80.0%	$\chi 2$=0.90 p=0.82
	TTA	1	3.3%	1	3.3%	DF=3 Not
	Sports Injury	5	16.7%	3	10.0%	significant
	Fall	3	10.0%	2	6.7%	
Injured Site1	Upper Extremity	7	23.3%	7	23.3%	$\chi 2$=0.0 p=1.00
	Lower Extremity	23	76.7%	23	76.7%	DF=1 Not significant
Duration of Injury	1-2 Hours	4	13.3%	3	10.0%	$\chi 2$=0.63 p=0.72
	2-3 Hours	17	56.7%	20	66.7%	DF=2 Not
	> 3 Hours	9	30.0%	7	23.3%	significant
Other Systemic Disease	Hypertension	11	36.7%	8	26.7%	$\chi 2$=0.69 p=0.40
	Others	19	63.3%	22	73.3%	DF=1 Not significant
Duration of Treatment	Hypertension	10	33.3%	8	26.7%	$\chi 2$=1.44 p=0.48
	Diabetes Mellitus	1	3.3%			DF=2 Not significant
	Others	19	63.3%	22	73.3%	
Previous Bone Problems	Major Fracture	29	96.7%	30	100.0%	$\chi 2$=1.01 p=0.38
	Sprains	1	3.3%			DF=1 Not significant
Previous other surgeries	No	30	100.0%	30	100.0%	$\chi 2$=0.0 p=1.00 DF=1 Not significant

Considering the Medical related variables RTA comprises more in both experimental and control group(70%and 80%), TTA also in same percentage (3.3), sports injury 16.7% in experimental, 10% in control group and fall clients 10.0% in experimental, 6.7% in control group.

Regarding injured site Lower extremity clients more (76.7%) in both groups, upper extremity injured clients also same 23.3% in the both.

In distribution of injury duration of time, 1-2 hours 13.3%in experimental 10.0% in control group, 2-3 hours 56.7%, 66.7% and > hours of duration clients 30.3%, 23.3% respectively.

Presence of other systemic diseases wise distribution Hypertension clients 33.3% in experimental 26.7% in control group, others were 63.3% in experimental 73.3% in control group. Only experimental group has one diabetic patient that is 3.3%.

No previous orthopaedic surgeries in both experimental and control group.

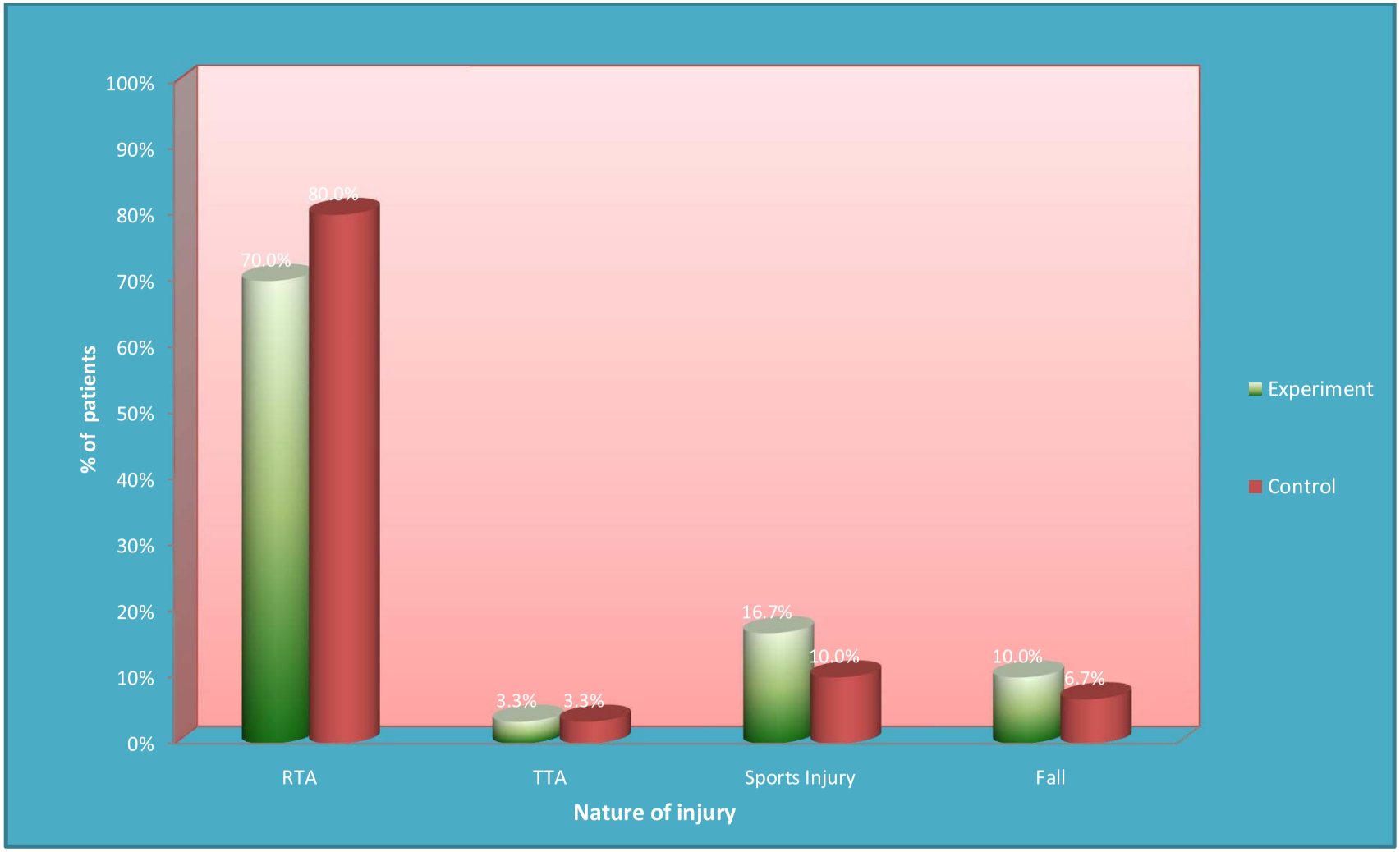

Fig 4.8 Shows Nature of injury wised distribution

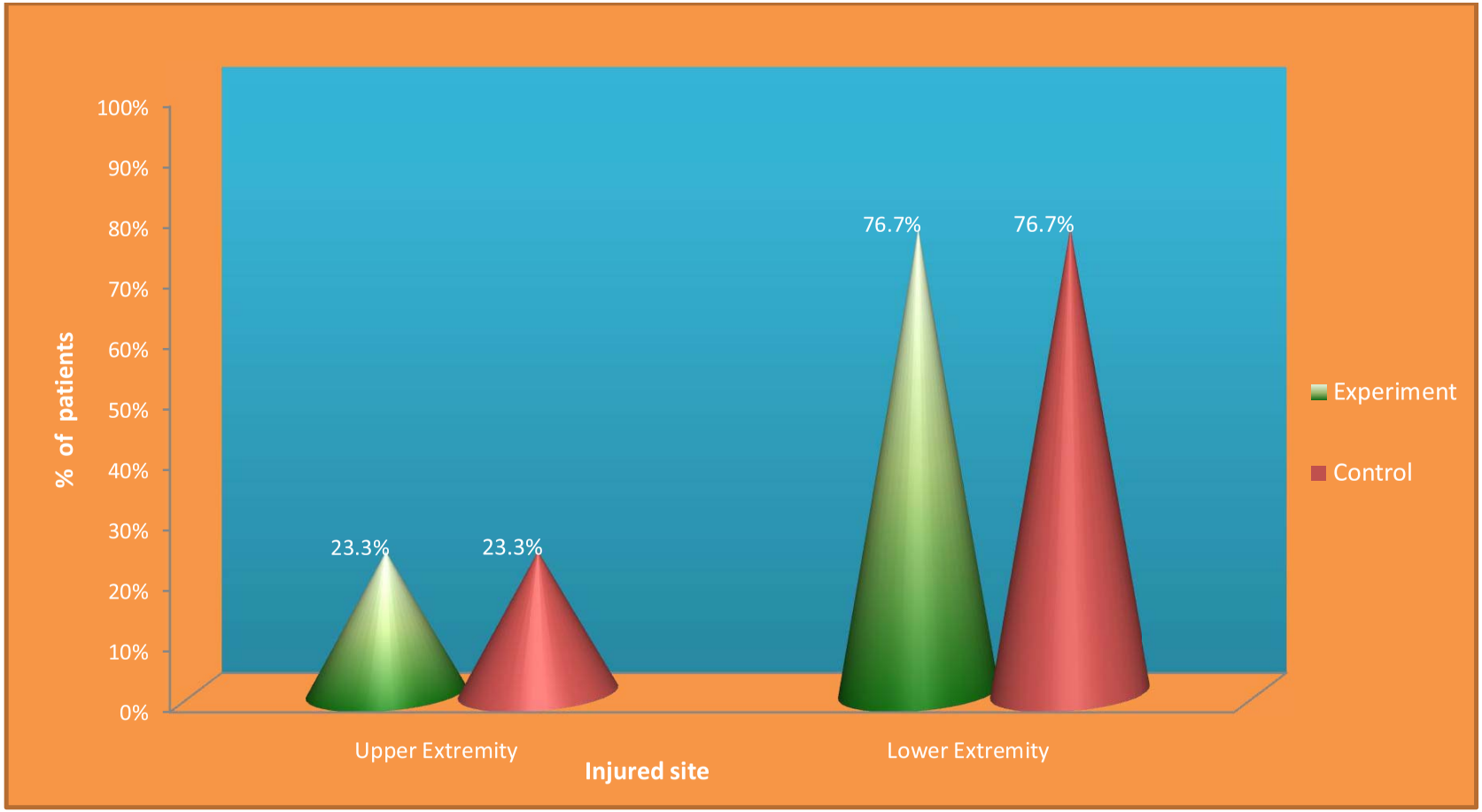

Fig 4.9 Shows the injured site wised distribution.

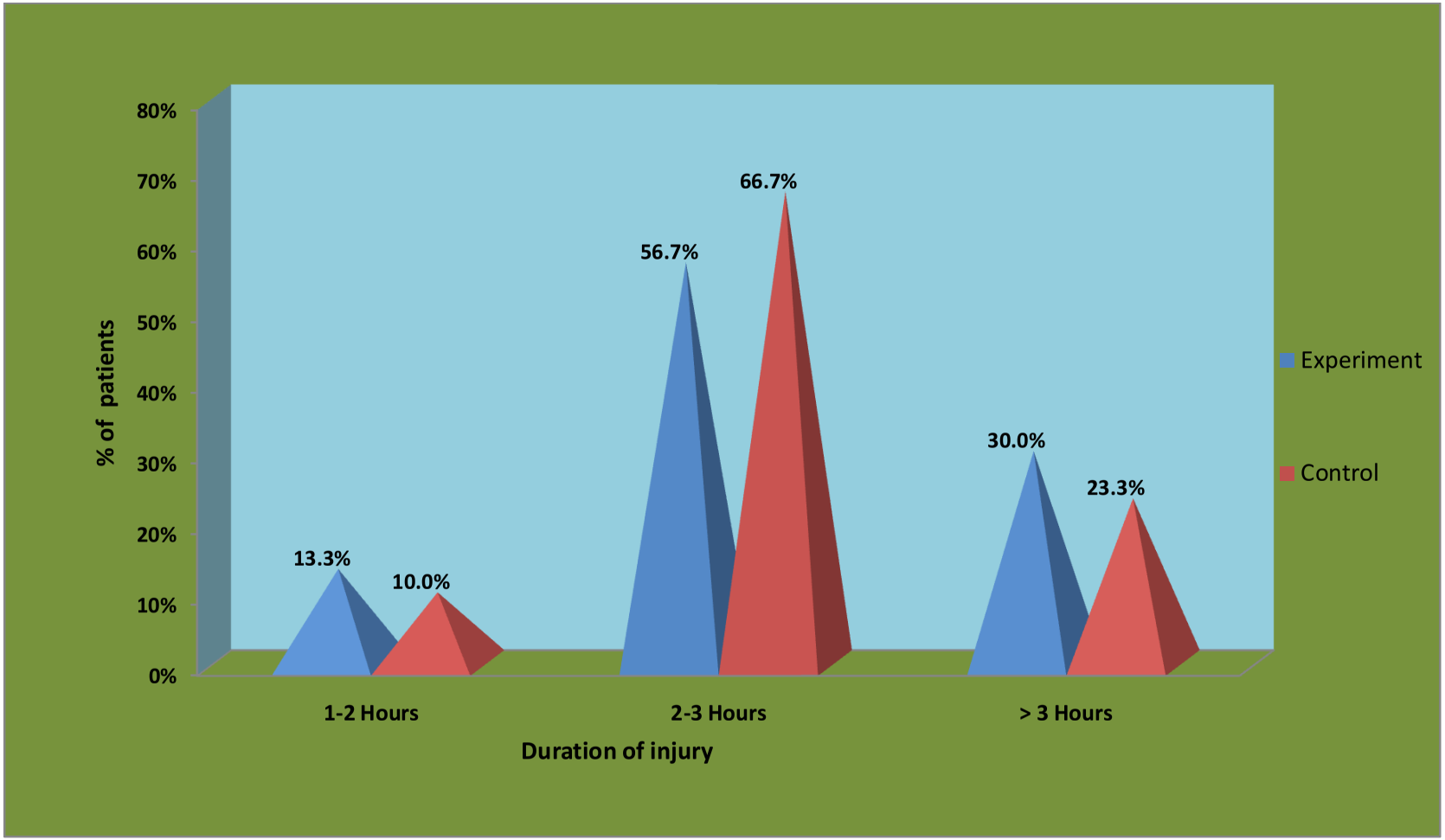

Fig 4 .10 Shows duration of injury wised distribution

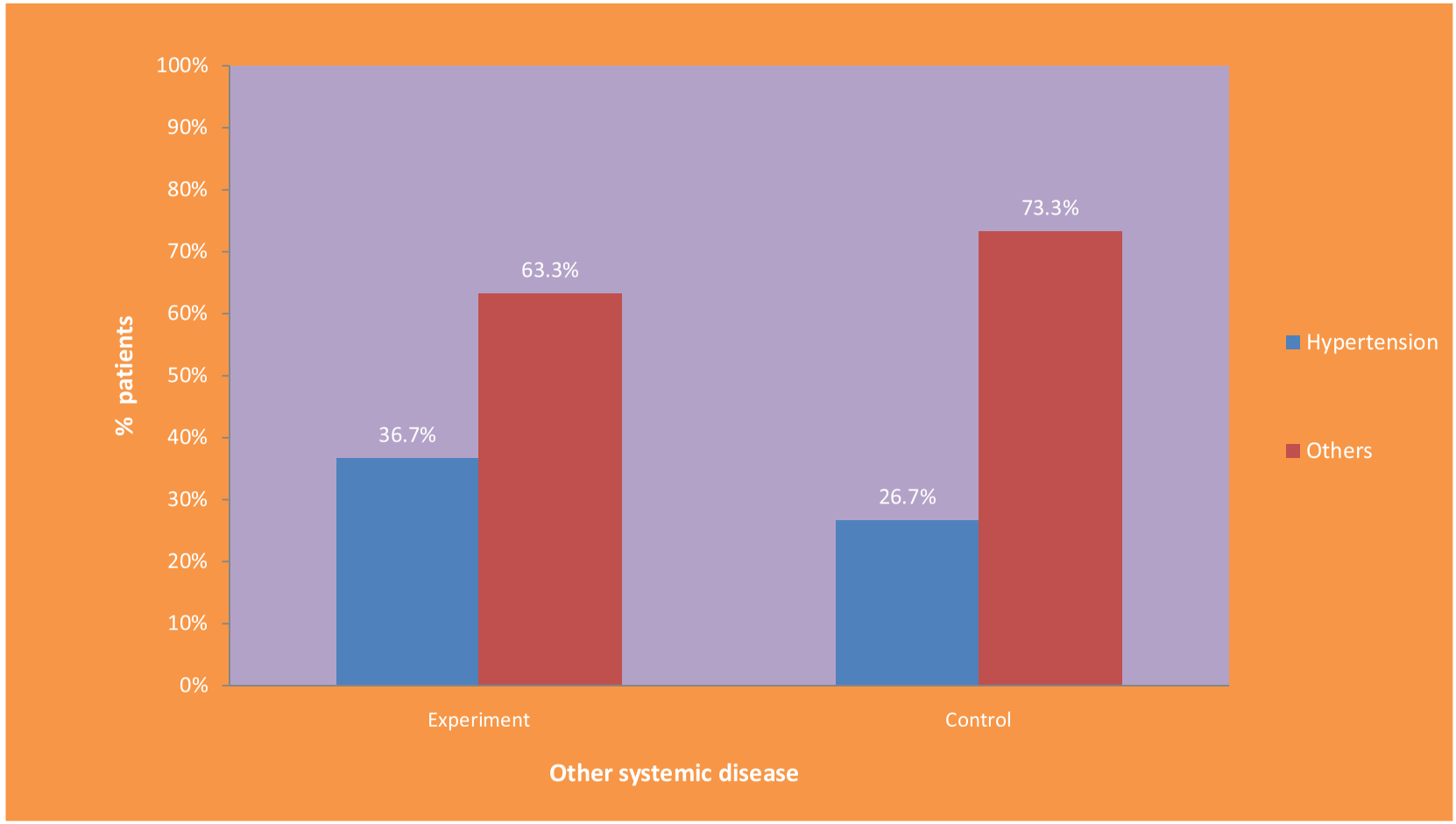

Fig 4.11 shows presence of systemic diseases with the samples.

SECTION: B

Assessment of the pre test level of Swelling among Experimental and control group.

Table 4.3: PRETEST LEVEL OF SWELLING

Pre test(swelling)	Experiment		Control		
	n	%	n	%	Chi square test
1-2 cms	4	13.3%	3	10.0%	
2-3 cms	6	20.0%	5	16.6%	χ2=0.38 p=0.94 DF=3, Not significant
3-4 cms	12	40.0%	14	46.7%	
>5 cms	8	26.7%	8	26.7%	
Total	30	100.0%	30	100.0%	

In Pre test

Among experiment group , 13.3% of them are having 1-2cms swelling, 20% are having 2-3 cms, 40% are having 3-4cms and 26.7% are having >5cms swelling. Among control group , 10.0% of them are having 1-2cms swelling, 16.6% are having 2-3 cms, 46.7% are having 3-4cms and 26.7% are having >5cms swelling. There is no significant difference between experiment and control group clients. Statistical significance was calculated using chi square test.

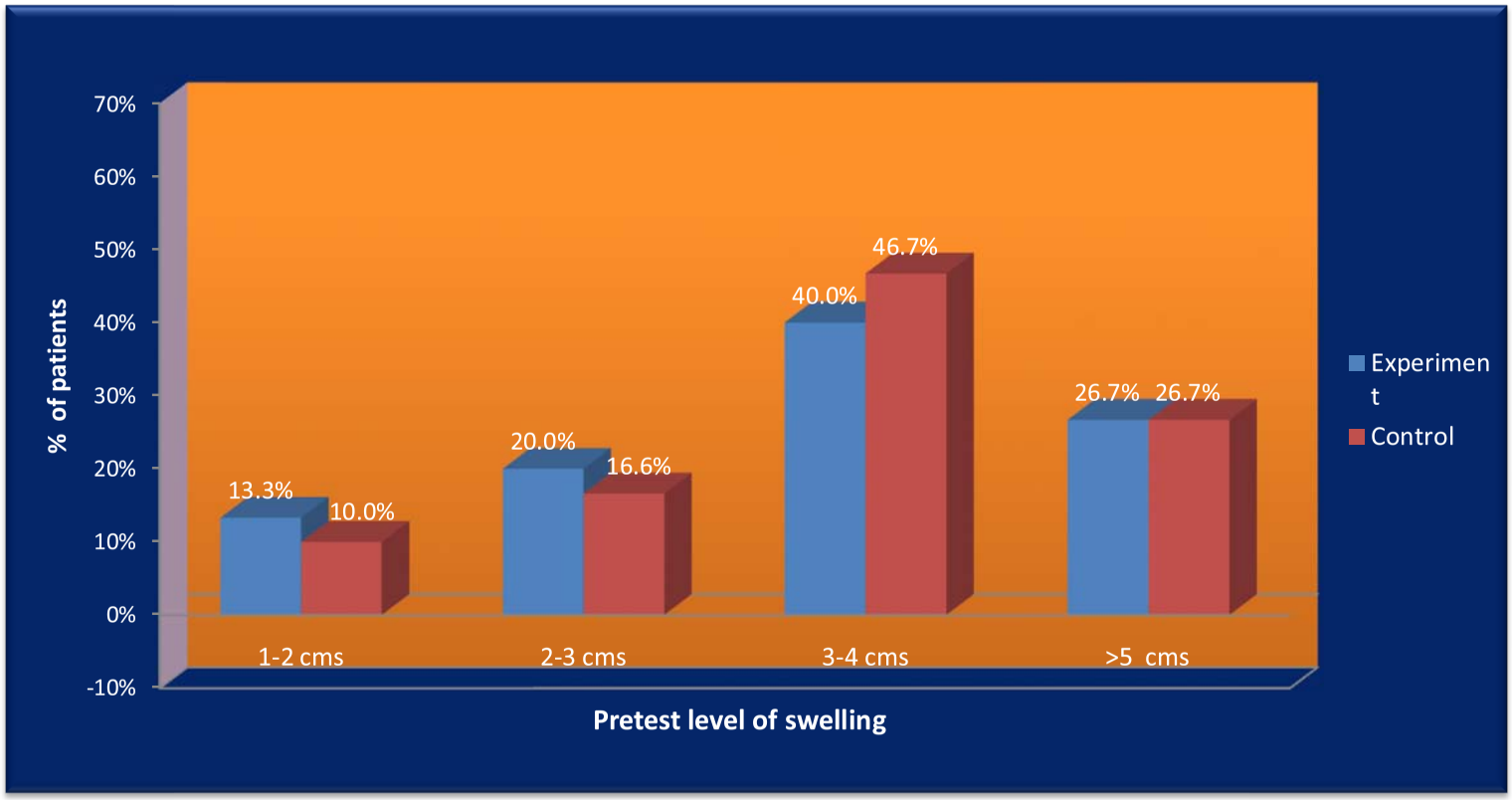

Fig 4.12 shows the pre test level of swelling

SECTION C :

Assessment of the post test level of Swelling among Experimental and control group.

Table 4.4: pre test & post test level of swelling (experiment)

Post test(swelling)	Pre test		Post test		Chi square test
	N	%	n	%	
0	0	0.0%	5	16.7%	**χ2=35.75 p=0.001*** DF=4 significant**
1-2 cms	4	13.3%	20	66.6%	
2-3 cms	6	20.0%	5	16.7%	
3-4 cms	12	40.0%	0	0.0%	
>5 cms	8	26.7%	0	0.0%	
Total	30	100.0%	30	100.0%	

In post test

Among experiment group , 16.7% of them are having no swelling , 66.6% of them are having 1-2cms swelling, 16.7% are having 2-3 cms, none are having 3-4cms and none are having >5cms swelling. Among control group , 13.3% of them are having 1-2cms swelling, 23.3% are having 2-3 cms, 46.7% are having 3-4cms and 16.7% are having >5cms swelling. There is a significant difference between experiment and control group clients. Statistical significance was calculated using chi square test.

Table4.5: Pre test & post test level of swelling (Control)

Post test(swelling)	Pre test		Post test		Chi square test
	n	%	n	%	
0	0	0.0%	0	0.0%	$\chi 2$=1.16
1-2 cms	3	10.0%	4	13.3%	p=0.76
2-3 cms	5	16.6%	7	23.3%	DF=3
3-4 cms	14	46.7%	14	46.7%	not
>5 cms	8	26.7%	5	16.7%	significant
Total	**30**	**100.0%**	**30**	**100.0%**	

Pre test and Post test level of swelling among control group where 46.7% clients had 3-4 cms and lasts as it is 46.7%, 26.7% had >5 cms of swelling and reduced only 16.7%. Totally the statistical pvalue for control group is =0.76 which is statically not significant.

Table 4.6 : Comparison of experiment and control swelling:

	No. of clients	Pre-test		Post-test		Mean Difference	Student independent t-test
		Mean	SD	Mean	SD		
Experiment	30	4.02	0.94	1.37	0.60	2.65	**χ2=12.31 p=0.001*** DF=29 significant**
Control	30	4.13	1.00	3.43	1.04	0.70	χ2=1.91 p=0.06 DF=29 Not significant

The pre and post level of swelling among experimental and control group which shows the mean difference 2.65 in experimental group which is significant and 0.70 in control group, Not statistically Significant.

Table 4.7 : COMPARISON OF PRETEST AND POSTTEST SWELLING

	No. of clients	Pre-test		Post-test		Mean Difference	Student paired t-test
		Mean	SD	Mean	SD		
Experiment	30	4.02	0.94	1.37	.60	2.65	**t=12.31 p=0.001*** DF=29 significant**
Control	30	4.13	1.00	3.43	1.04	0.70	t=1.91 p=0.06 DF=29 Not significant

The pre and post level of swelling among experimental and control group which shows the mean difference 2.65 in experimental group which is significant and 0.70 in control group, not statistically Significant.

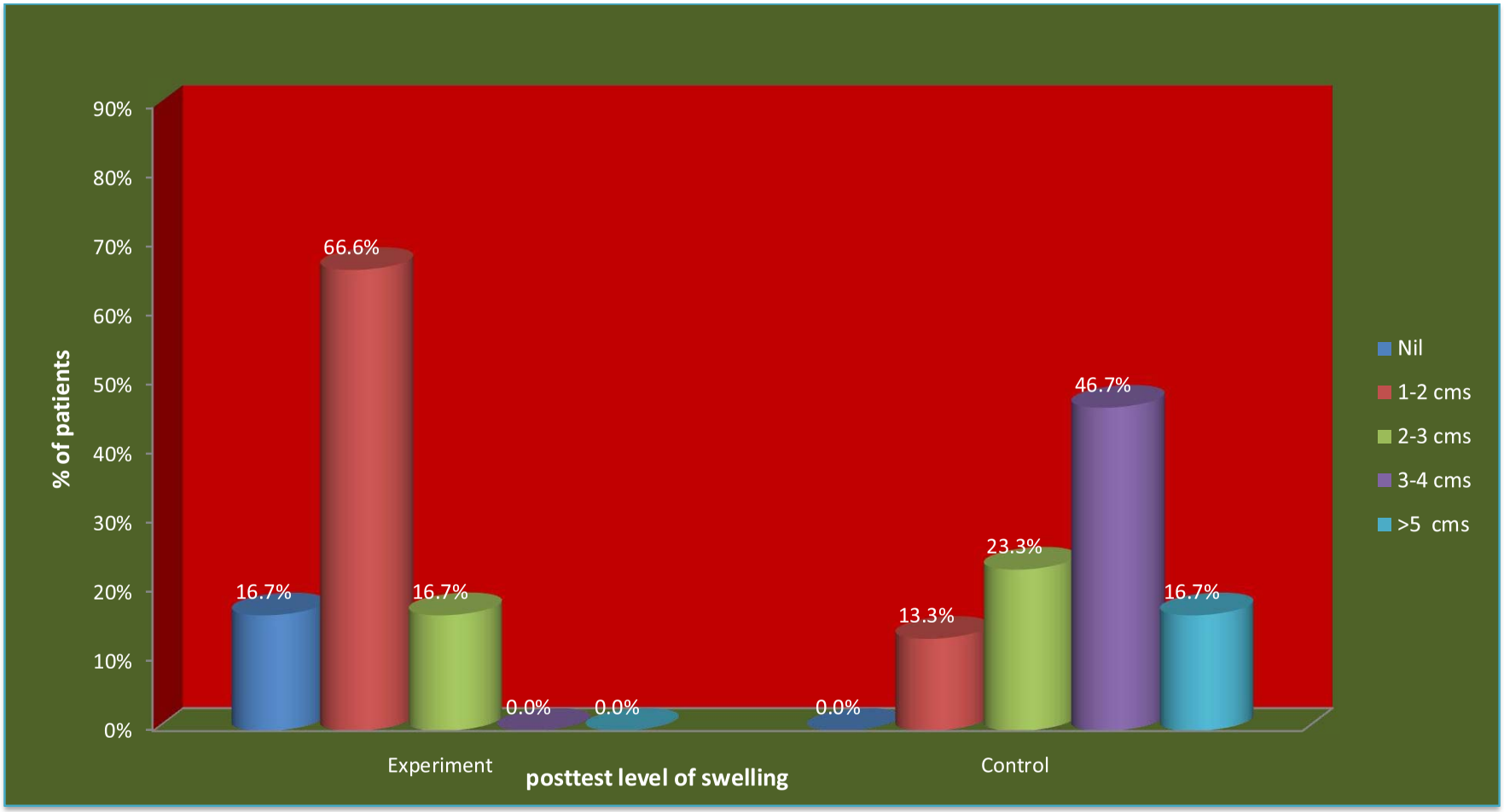

Fig 4.13 depicts the Post test level of swelling

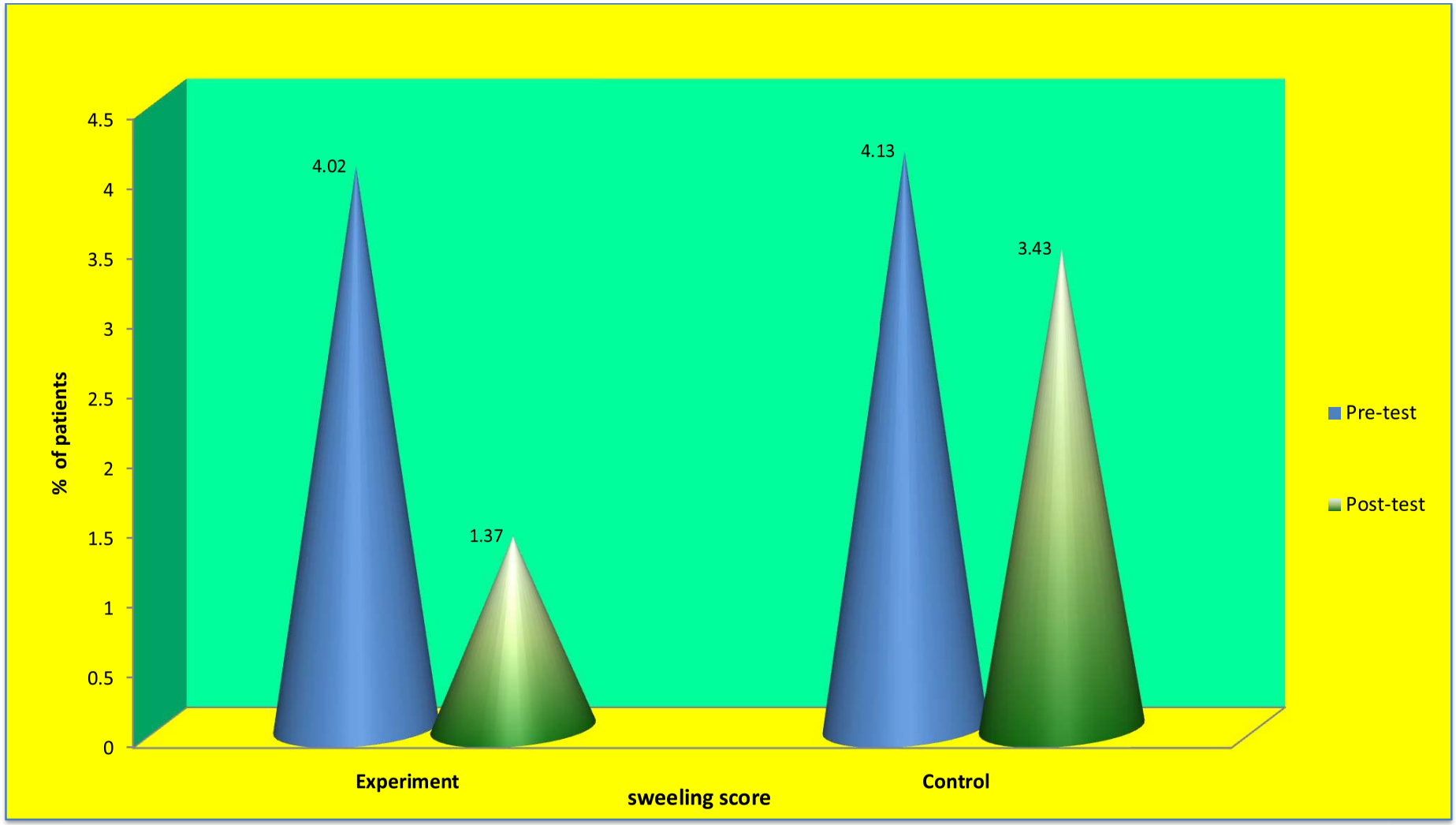

Fig 4.14 shows the comparative level of pre and post test swelling score

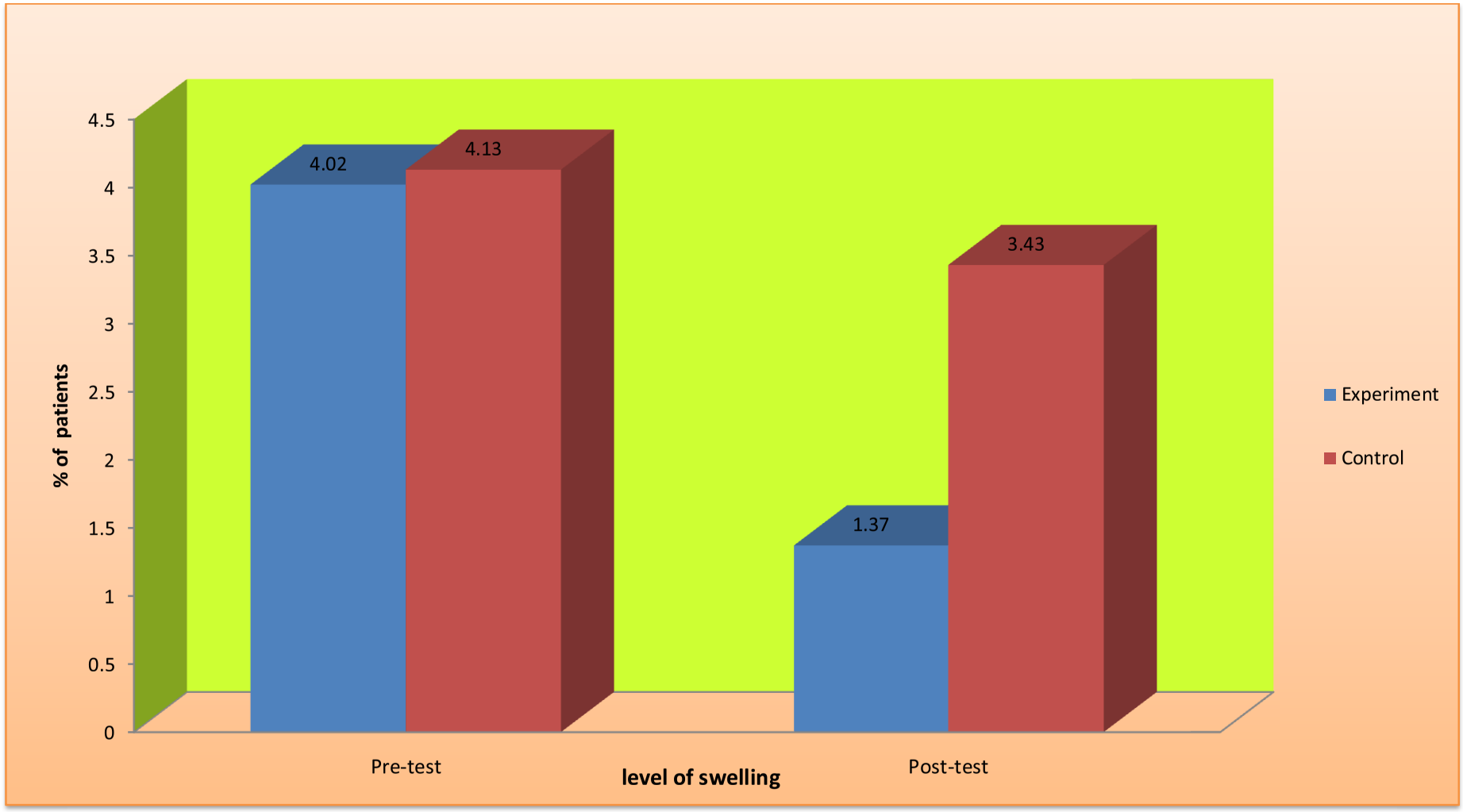

Fig 4.15 shows the comparison of pre and post test level of swelling

SECTION-D

Assessment of the effectiveness of Ice-cold application among experimental group.

Table 4.8: Pre test & Post test Level of Swelling (Experiment)

Post test(swelling)	Pre test		Post test		Chi square test
	n	%	n	%	
0	0	0.0%	5	16.7%	**χ2=35.75 p=0.001*** DF=4 significant**
1-2 cms	4	13.3%	20	66.6%	
2-3 cms	6	20.0%	5	16.7%	
3-4 cms	12	40.0%	0	0.0%	
>5 cms	8	26.7%	0	0.0%	
Total	30	100.0%	30	100.0%	

*significant at P≤ 0.05, **highly significant at P≤ 0.01, ***very high significant at P≤0.001

In the experimental group 26.7% of the clients had >5 cms of swelling which reduced into 0.0% after 20-30minutes of ice-cold application, similarly 40.0% of the clients had 3-4 cms reduced into 0.0%, 20.0% had 2-3cmsand reduced as 16.7%, 13.3% had 1-2 cms and increased as 66.6% and None of the patient had 0.0% swelling in the pre test, but in the post test it increased into 16.7% ,which is statistically very high significant (p =0.001***).

Table 4.9: ***Effectiveness of Ice Cold Application***

		Mean swelling score	Mean Difference in wound score with 95% Confidence interval	Percentage of wound score with 95% Confidence interval
Experiment	**Pre test**	**4.02**	**2.65(2.31-2.97)**	**65.1%(57.4%-73.8%)**
	Post test	**1.37**		
Control	**Pre test**	**4.13**	**0.70(0.54-0.85)**	**16.9%(13.1% -20.8)**
	Post test	**3.43**		

On an average, experiment clients are reduced 65.1% of swelling score after Ice cold application Control *patient, are reduced 16.9% of score .This shows the effectiveness of* Ice cold application. *Differences between pre test and post test score was analysed using percentage with 95% CI and mean difference with 95% CI.*

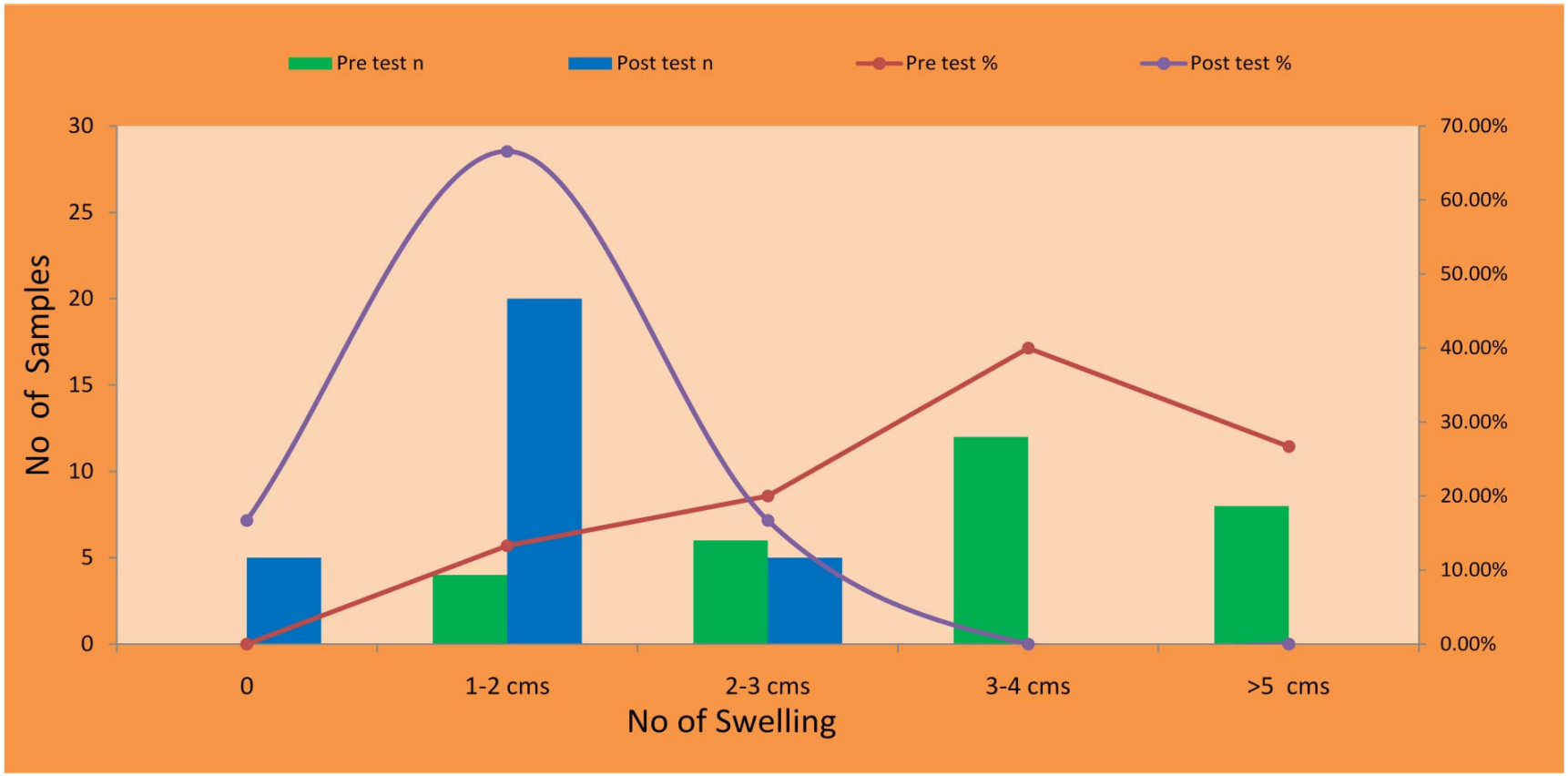

Fig 4.16 Shows the effectiveness of ice cold application no of samples, level of swelling and percentage of effectiveness wise.

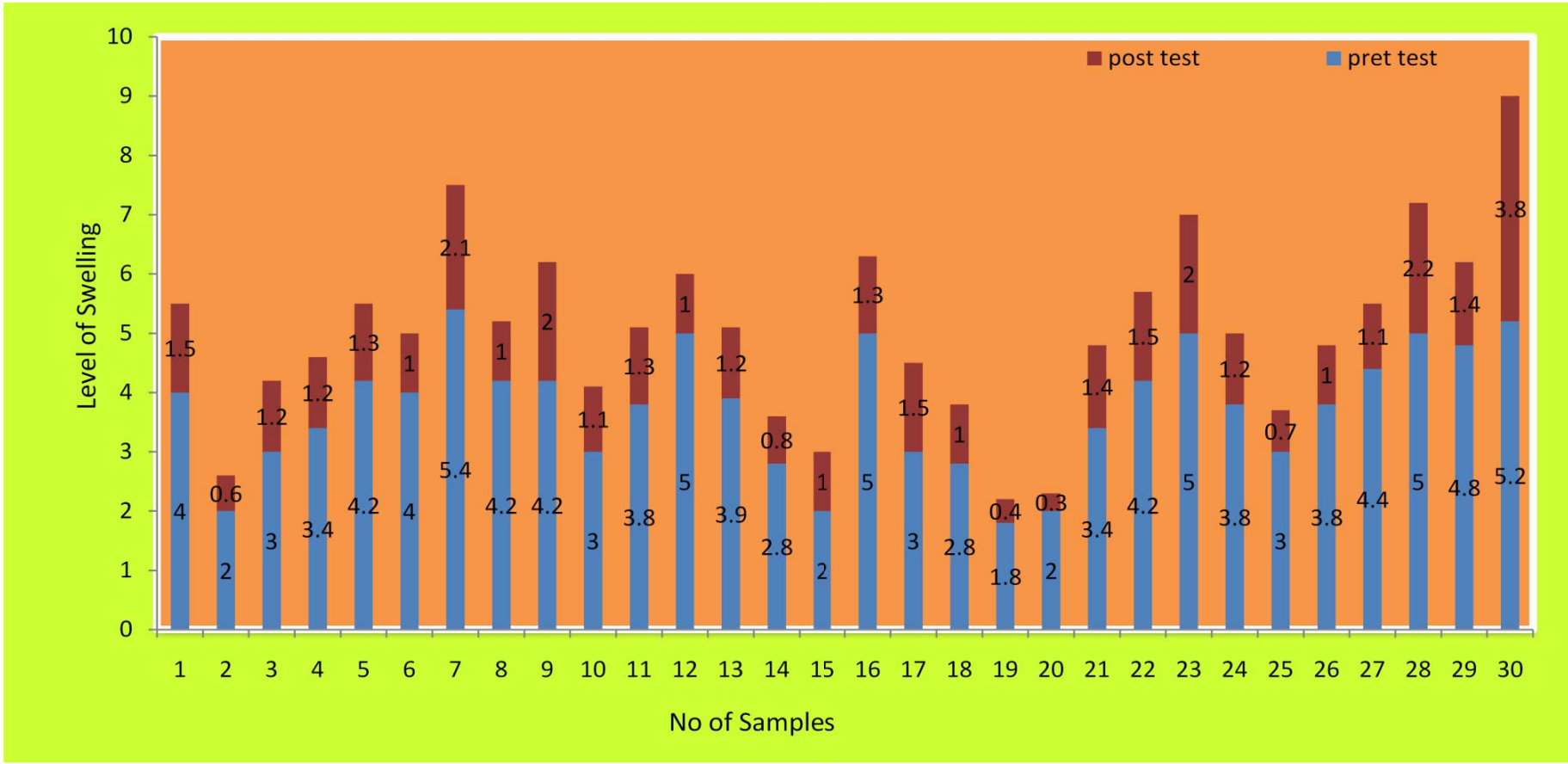

Fig 4.17 Shows the effectiveness of ice cold application each sample wise.

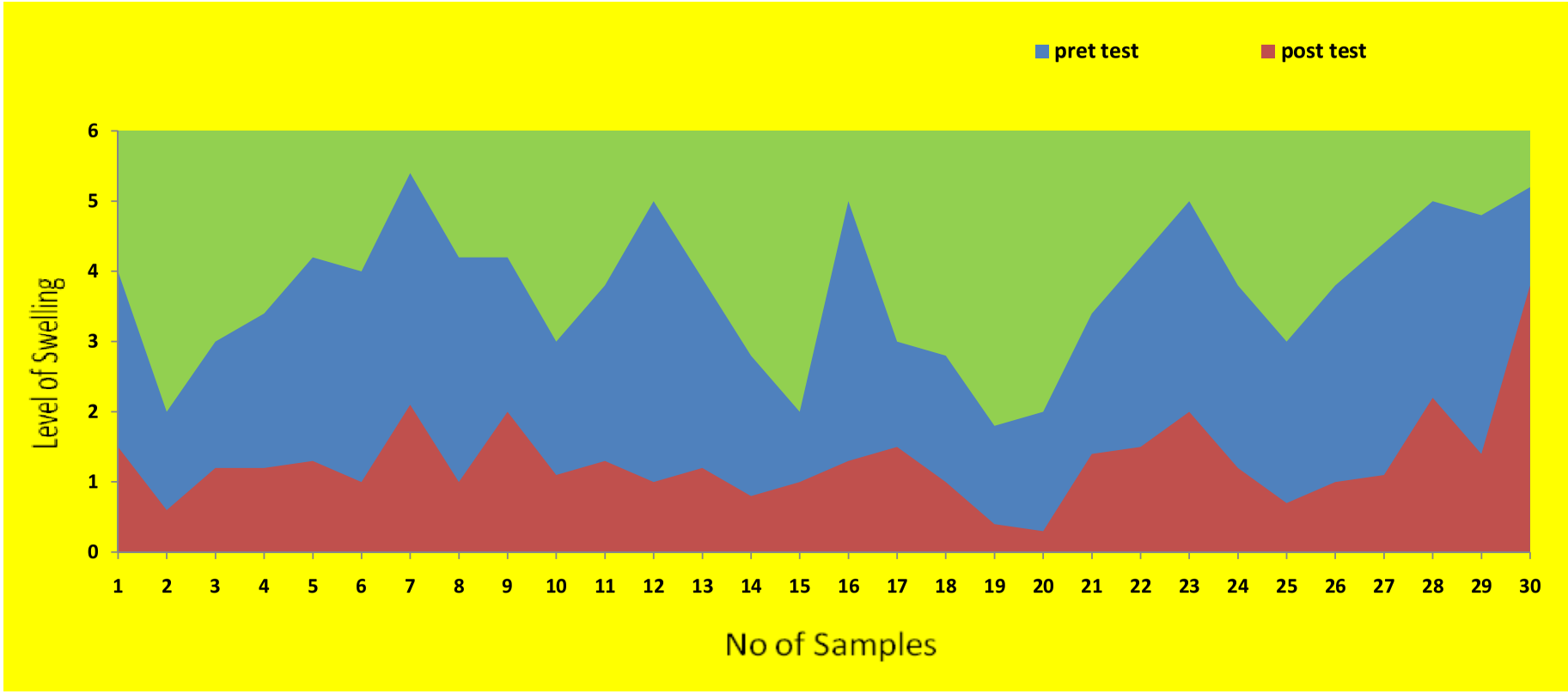

Fig 4.18 Shows the whole effectiveness of ice cold application.

SECTION - E

Associate the effectiveness of Ice-cold application with selected Demographic and clinical variable.

Table 4.11: Association between swelling reduction score and clients demographic variables (experiment)

Demographic variables		Level of swelling reduction score				Total	Chi square test
		Below average(≤2.65)		Above average(>2.65)			
		n	%	n	%		
Age in years	21 -30 years	2	16.7%	10	83.3%	12	**χ2=14.17 p=0.01** DF=3 significant**
	31 -40 years	1	16.7%	5	83.3%	6	
	41 -50 years	7	87.5%	1	12.5%	8	
	51 -60 years	4	100.0%	0	0.0%	4	
Sex	Male	5	29.4%	12	70.6%	17	**χ2=6.65 p=0.01 * DF=1 significant**
	Female	10	76.9%	3	24.1%	13	
Education Qualification	Uneducated	3	60.0%	2	40.0%	5	χ2=0.26 p=0.87 DF=2 not significant
	Primary Education	7	46.7%	8	53.3%	15	
	Higher Secondary	5	50.0%	5	50.0%	10	
Occupation	Professional			2	100.0%	0	χ2=3.75 p=0.06 DF=3 not significant
	Business	1	12.5%	7	87.5%	2	
	Skilled Work			1	100.0%	8	
	Unemployed	14	73.7%	5	26.3%	1	
Family Income	< Rs.5000	4	80.0%	1	20.0%	19	χ2=5.08 p=0.17 DF=3 not significant
	Rs.5001 -10000	8	57.1%	6	42.9%	5	
	Rs.10001 - 15000	3	33.3%	6	66.7%	14	
	> Rs.15000			2	100.0%	9	
Religion	Hindu	12	52.2%	11	47.8%	2	χ2=3.84 p=0.14 DF=2 not significant
	Christian	1	20.0%	4	80.0%	23	
	Muslim	2	100.0%			5	
Marriage status	Unmarried	7	58.3%	5	41.7%	2	χ2=0.55 p=0.45 DF=1 not significant
	Married	8	44.4%	10	55.6%	12	
Living place	Urban	10	43.5%	13	56.5%	18	χ2=1.72 p=0.42 DF=2 not significant
	Semi Urban	3	75.0%	1	25.0%	23	
	Rural	2	66.7%	1	33.3%	4	
Food Habit	Vegetarian	3	60.0%	2	40.0%	3	χ2=0.24 p=0.64 DF=1 not significant
	Non-Vegetarian	12	48.0%	13	52.0%	5	

The association of level of swelling reduction score with selected demographic variable. Younger and male clients are benefitted more than others. Statistical significance was calculated using chi square test.

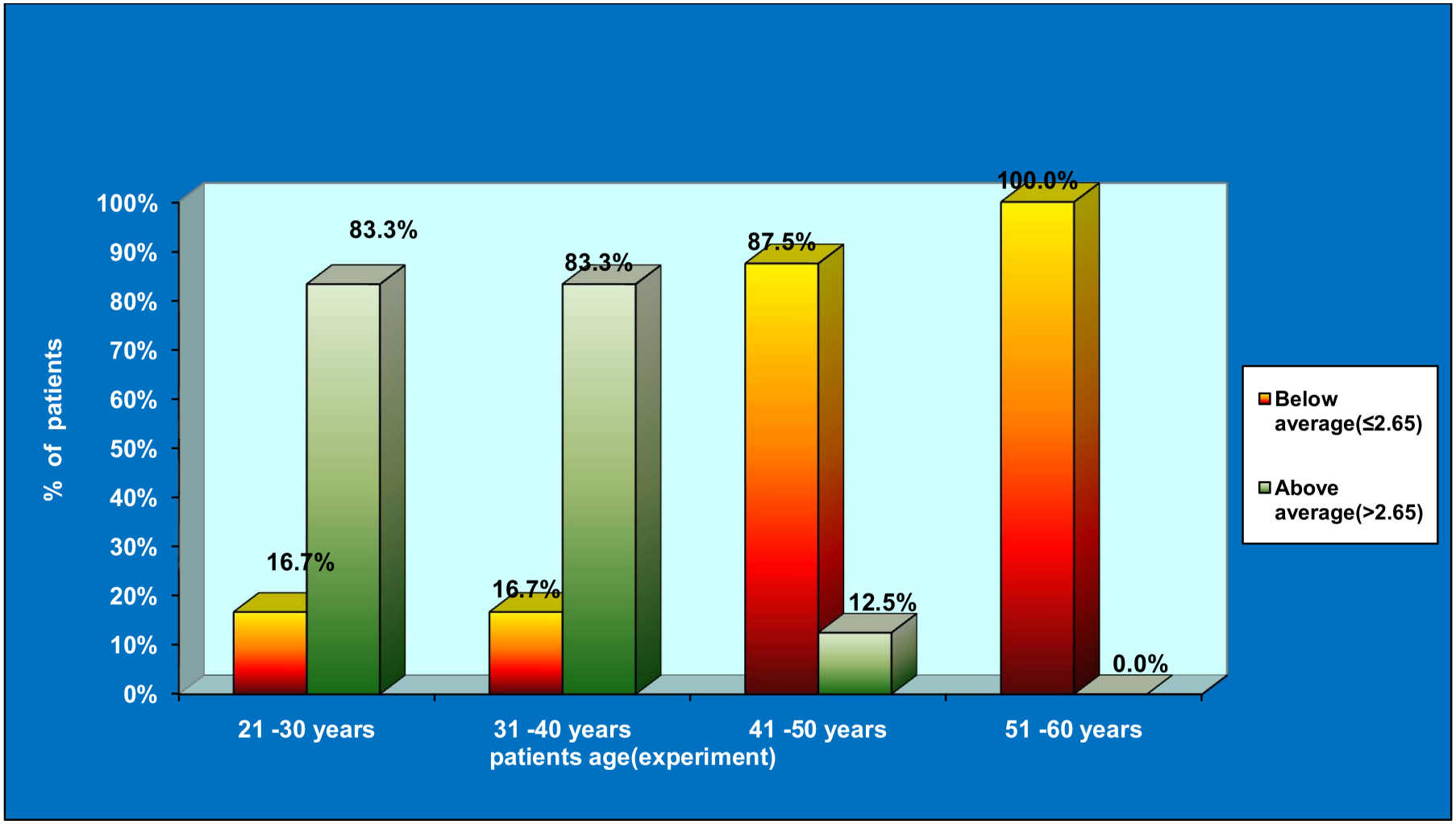

Fig 4.19 shows the age wised association of swelling reduction.

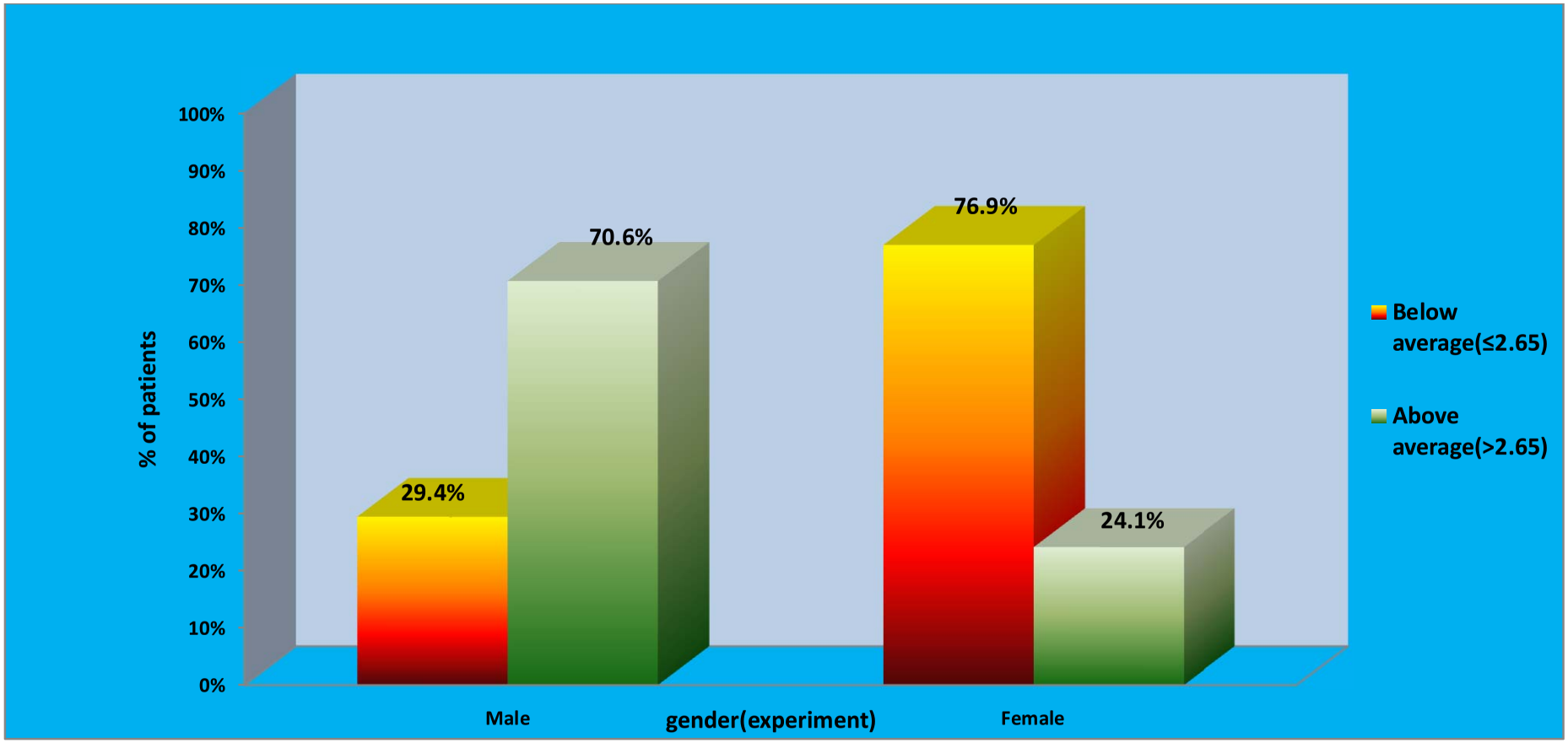

Fig 4.20 Depicts association between level of swelling reduction and gender.

Table4. 12: Association between swelling reduction score and clients medical related variables (Experiment)

Medical related variables		Level of swelling reduction score: Below average(≤2.65) n	%	Above average(>2.65) n	%	Total	Chi square test
Nature of Injury	RTA	10	47.6%	11	52.4%	21	χ2=1.58 p=0.66 DF=3 not significant
	TTA	1	100.0%			1	
	Sports Injury	2	40.0%	3	60.0%	5	
	Fall	2	66.7%	1	33.3%	3	
Injured Site	Upper Extremity	1	14.3%	6	85.7%	7	**χ2=4.65 p=0.03 DF=1 significant**
	Lower Extremity	14	60.9%	9	39.1%	23	
Duration of Injury	1-2 Hours	3	75.0%	1	25.0%	4	**χ2=7.91 p=0.02* DF=2 significant**
	2-3 Hours	11	64.7%	6	35.3%	17	
	> 3 Hours	1	11.1%	8	88.9%	9	
Other Systonic Disease	Hypertension	3	27.3%	8	72.7%	11	χ2=2.29 p=0.17 DF=1 not significant
	Others	12	63.2%	7	36.8%	19	
Previos Bone Problems	Major Fracture	15	51.7%	14	48.3%	29	χ2=1.03 p=0.30 DF=1 not significant
	Sprains			1	100.0%	1	
Previous other surgeries	No	15	50.0%	15	50.0%	30	χ2=0.00 p=1.00 DF=1 not significant

The association of level of swelling reduction score with medical related variable; injured site and duration of injury variables are significant. Statistical significance was calculated using chi square test.

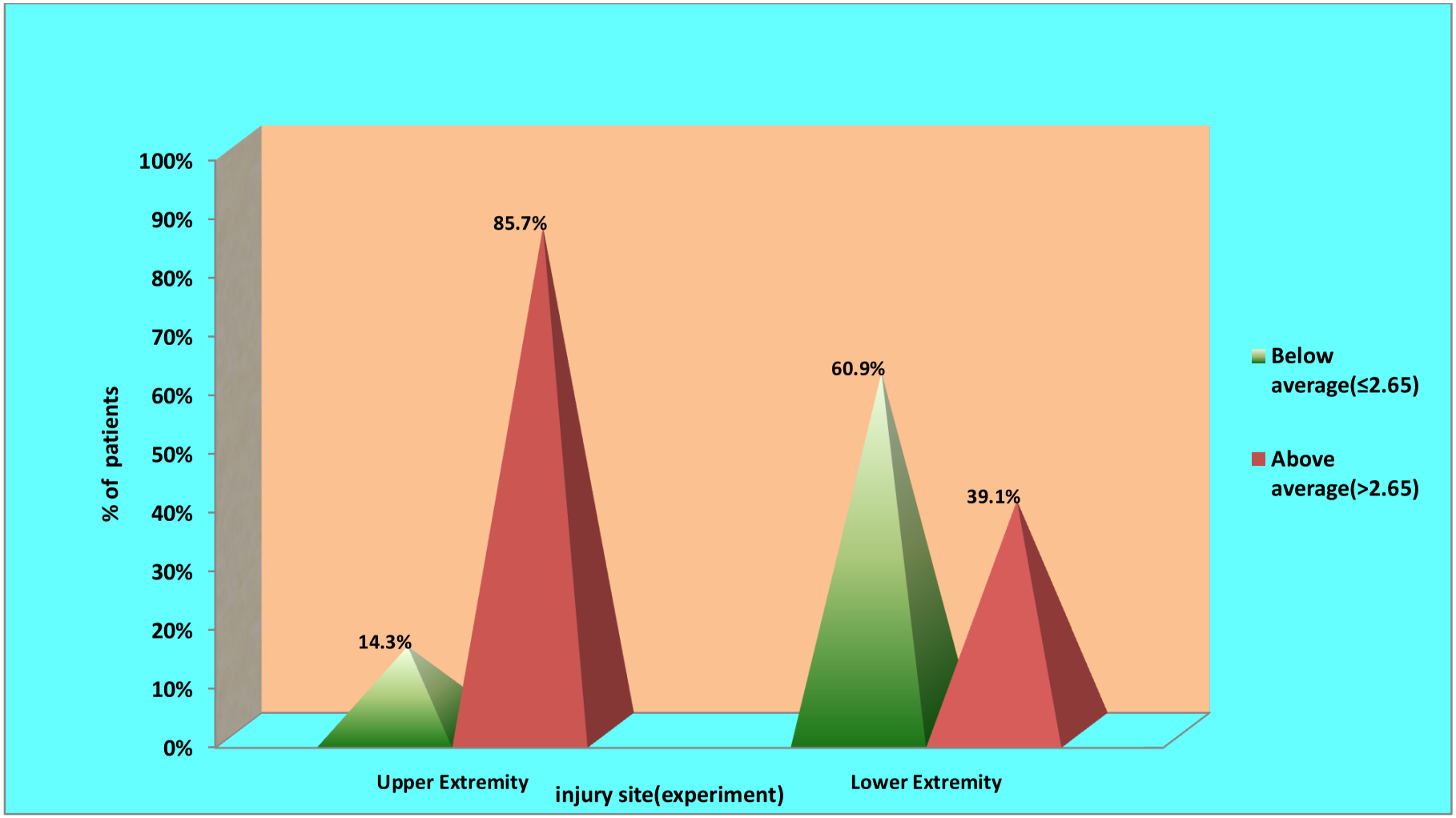

Fig 4.21 Shows the association between level of swelling reduction and injury site.

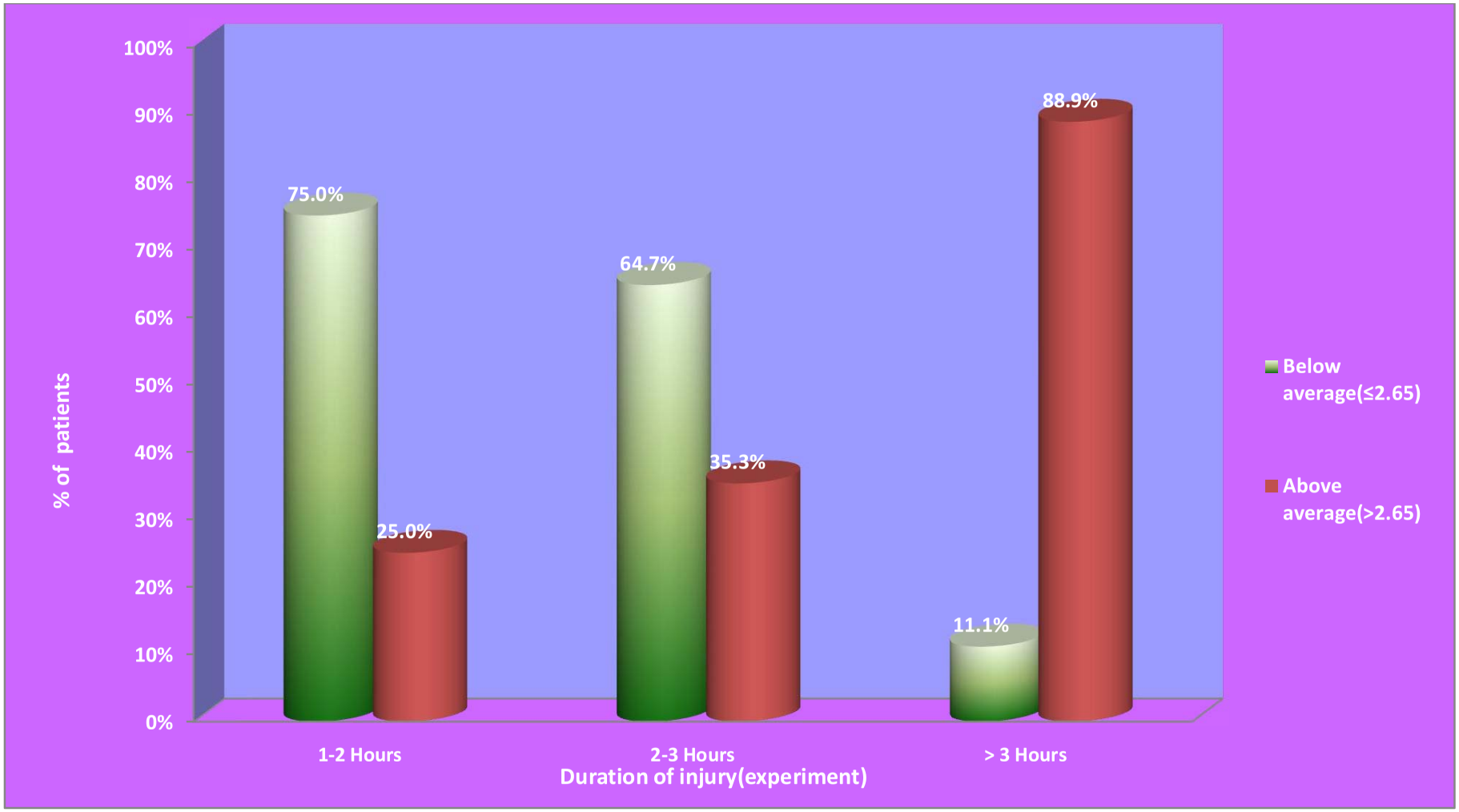

Fig 4.22 Shows the association between level of swelling reduction and duration of injury.

CHAPTER – V

DISCUSSION

"A lot of my research time is spent daydreaming - telling an imaginary admiring audience of laymen how to understand some difficult scientific idea."

Leonard Susskind

This chapter deals with the discussion of the results of the data analysed based on the objectives of the study. The main aim of the study is to assess the effectiveness of Ice-cold application on swelling management among Clients with acute musculoskeletal injury.

The study sample consisted of 60 clients who had acute musculoskeletal injury. (30 experimental and 30 control group), their level of swelling was assessed with Inch tape measuring scale. The investigator collected the demographic data from the clients who satisfied the inclusion criteria.

Characteristics of Demographic and Clinical Variables

The demographic characteristics of 60 samples who participated in the study were mostly under the age group of 21-30 years, (40%) in experimental and(43.3%) in Control group, male clients(70%) and female clients (30%) and unemployed were (63.3%) in experimental group and (43.3%)in control group, most of the samples were between the income group of 5001-10000 were 46.7% of were in experimental group and 33.3% in control group. Majority of samples were Hindus and were married both in experimental and control group. Considering the Food habit, non vegetarians 83.3% in experimental group 86.7% in control group.

Regarding clinical variables majority of the samples had met with Road Traffic Accidents among them 80.0% were in control group and 70.0% were in experimental group. Most of the experimental group and control group (76.7%) affected in the lower extremity only. In duration of injury 2-3 hours of time

(56.7%) in experimental and(66.7%) control group. No previous orthopaedic surgery Clients in both (0.00%) group.

The first objective of the study is to assess the level of swelling among clients with acute musculoskeletal injuries in the control and experimental group.

The pre test level of swelling score before Ice-cold application shows that there is not much difference in swelling score between experimental and control group.

Majority of the samples were in severe swelling (>5cms) in both experimental group (26.7%) and control group 8 (26.7%). Samples with 3-4 cms in experimental group Were 12 (40.0%) and 14 (46.7%) in control group. 2-3 cms level of swelling in experimental group 6(20.0%) and in control 5(16.6%) .1-2 cms level of swelling in experimental group 4 (13.3%) and in control 3(10.0%). None of the samples were in without swelling.

Funda Esen Buyukyilmaz (2008) conducted a study on swelling characteristic in Turkish orthopaedic clients, in the assessment of swelling severity on acute musculo injured clients in that 2-3 hours of duration in the day of injury, stastistically significant differences were found between clients swelling severity scores ($p \leq .001$),it was concluded that nurses must learn the acute orthopaedic ice-cold application intervention, with orthopaedic clients to implement safe and effective acute swelling management.

The second objective of the study is to assess the effectiveness of ice cold application in acute musculoskeletal injured clients in experimental group.

The swelling score experimental group >5cms was 26.7%, and it reduced to 0.0%, 3-4cms was 40.0% and reduced to 0.0%, 2-3cms 20.0% and further reduced to 16.7%, 1-2cms 13.3% on the whole reduction and effectiveness of ice-cold application it increased as 66.6% and no swelling clients 0.0% because of on the whole effectiveness of ice cold application it elevated as 16.7%.

Li Fang, et al(2011) conducted a prospective double blinded quasi experimental study to examine 'The Effects of cryotherapy in relieving Anterior Crucial Ligament Tear swelling', the aim of the study was to examine whether the application of cryotherapy with ice in a plastic bag is effective in reducing the severity of swelling. 59 clients were assigned to receive cryotherapy (experimental group 33 people) and without cryotherapy(control group 26 clients). Experimental group received three 10 minutes series of ice packing over a three hour period with 50 minutes interval. The swelling score of the experimental group decreased from 5.12-1.82 after cryotherapy, while the swelling score in the control group decreased from 4.04- 2.88.

The third objective of the study is to assess the effectiveness of ice cold application in acute musculoskeletal injured clients by comparing control group and experimental group.

Considering swelling score in control group, pre test swelling score per >5cms (26.7%) which remains 16.7% in post test.3-4cms (46.7%) not changed in post test (46.7%) as it is. On the whole score in pre test was 4.13 and post test was3.43. Where as in experimental group, pre test swelling score >5cms (26.7%) which significantly disappeared to nil (0.0%) and in the same way 3-4 cms (40.0%) and reduced to(0.0%), 2-3 cms score in pre test(20.0%) reduced to 16.7%, 1-2 cms (13.3%) which increased to (66.6%) and because of on the whole effectiveness no swelling clients in the post test were (16.7%).

Swelling assessed with Inch tape measuring scale in pre and post test, control group score assessed with mean values. For control group the score was 4.13 in pre test and 3.43 in post test, with the mean difference of **0.70(0.54-0.85),** experimental group score assessed with mean values. For experimental group the score was 4.02 in pre test and 1.37 in post test, with the mean difference of **2.65(2.31-2.97),** after ice cold application.

On an average, experiment clients are reduced 65.1% of swelling score after Ice cold application Control patient, are reduced 16.9% of score .This shows the effectiveness of Ice cold application. Differences between pre test and post

test score was analysed using percentage with 95% CI and mean difference with 95% CI and it is statistically highly significant (P=0.001***).

Stockle et al (2013) compared the effectiveness of three treatment modalities in reducing acute post-traumatic and post-operative swelling following foot and ankle trauma. Sixty clients, 48% (29 of 60) with ankle fractures, were stabilized in a split plaster cast and randomized to receive either cool packs (n = 20, mean age: 33.1 years), continuous cryotherapy with the Polar Care device (n = 20, mean age: 31.9 years), or intermittent impulse compression with the A-V Impulse System (Novamedix Services Ltd, Andover, Hants, UK) (n = 20, mean age: 36.8 years) without concomitant cryotherapy. Clients randomized to cool pack treatment had the pack changed four times per day and fixed around the swollen area with an elastic dressing providing static compression. Clients receiving continuous cryotherapy had a flexible cool cuff wrapped around the swollen area with a continuous flow of ice water. Lastly, clients treated with impulse compression used a foot pump device that simulated weight-bearing by intermittently compressing and stretching the *venae comitantes* of the lateral plantar artery. With this device, an under the foot air pad inflates every 20 seconds, squeezing and flattening the plantar arch resulting in the rapid evacuation of 20 to 30 mL of blood from the plantar venous plexus.

After 24 hours of treatment, there was a 47% reduction in swelling with the impulse compression device, 33% with continuous cryotherapy and 17% with cool packs. After four days of post-operative treatment, the impulse system reduced swelling by 74% versus 70% with continuous cryotherapy and 45% with cool packs. All of these comparisons reached statistical significance in favor of either impulse compression or continuous cryotherapy over standard use of cool packs with mild static compression.

The fourth objective of the study is to find out the association between the levels of swelling in acute musculoskeletal injured clients with selected variables in the control and experimental group.

The Age (p = 0.01) and Sex (p = 0.01) are significantly associated with level of swelling score. Samples in the age group of 21 to30 years 12 (83.3%), 31-40 years6 (83.3%), 41-5- years 8(12.5%),of them shows significance with the p value of (p= 0.01*).

Comparing the Sex majority of male samples 17 70.6%) ,female samples 13(24.1%) were shows significance with the p value of 0.01.which shows male clients are more benefited than female clients. (p= 0.01*). The injured site upper extremity 7(14.3%), lower extremity injuries shows the significance on intervention 23(60.9%) with the p value of 0.03.The lesser duration of injury i.e. 1-2 hours(75.0%) are benefited more than increased duration of injury i.e. >3hours and it is statistically significant (p= 0.02*).

CHAPTER – VI

SUMMARY, CONCLUSION, IMPLICATIONS, RECOMMENDATIONS AND LIMITATIONS.

'Be yourself and thing for yourself and while your conclusion may not be infallible, they will be nearer right than the conclusion forced upon you.'

Elbert Hubbard

A study is said to be incomplete, if it results are not communicated effectively to its users and consumers. This chapter outlines the present study approaches, major findings with inferences drawn from its, implication for nursing profession, limitations, conclusions and recommendations.

6.1 SUMMARY

Management of swelling in acute musculoskeletal injury relieves suffering and leads to pain control, control of further inflammation earlier mobilization, shortened hospital stay, reduced hospital costs, and increased patient satisfaction. Swelling control regimens should not be standardized; rather, they are tailored to the needs of the individual patient, taking into account their medical, psychological, and physical condition, age, level of fear or anxiety, surgical procedure needed, personal preference, and response to agents given. The major goal in the management of swelling in acute musculoskeletal injury is minimizing the dose of medications to lessen side effects while still providing adequate other medical management. This goal is best accomplished with multimodal anti inflammatory agents. Clients suffer from inflammatory swelling in many ways. It robs clients of their lives especially acute swelling in traumas. Pellino and colleagues reported that between 19 and 28 percent of clients in the usual care control group used nondrug techniques during the first 3 hours after Injury. Nurses have used non drug techniques for years to help clients manage Inflammation and as well as infection.. These techniques have been labelled differently over the years. Non invasive, non pharmacological, nondrug, and complementary therapies have been used interchangeably to reflect non medical therapies. So the investigator

undertook the study "Assess the effectiveness of ice cold application in the reduction of swelling prior to plaster of paris management in acute musculoskeletal injuries among clients admitted in Emergency Orthopaedic and Traumatology ward at Rajiv Gandhi Government General Hospital, Chennai-03."

The Objectives of the study are

1. To assess the level of swelling among clients with acute musculoskeletal injuries in the control and experimental group.

2. To assess the effectiveness of ice cold application in acute musculoskeletal injured clients in experimental group.

3. To assess the effectiveness of ice cold application in acute musculoskeletal injured clients by comparing control group and experimental group.

4. To find out the association between the levels of swelling in acute musculoskeletal injured clients with selected variable in the control and experimental group.

The variables of the study were

Independent variable : Ice cold application.

Dependent variable : Swelling

HYPOTHESIS:

H1- There is significant effect in reduction of swelling after ice cold application in acute musculoskeletal injured clients.

H2- There is significant difference in the level of swelling among control and Experimental group.

The review of literature was done from primary and secondary sources that formed the basis for the formulation of problem selection, development of the tools, developing the theoretical frame work, selecting research methodology and about components and method of Ice cold application.

The conceptual frame work for the study was based on Donabedian's structure process and outcome theory and it provides a comprehensive frame work for achieving the objectives of the study. The research design selected for this study was true experimental design. The study was conducted in Emergency Orthopaedic and Traumatology Ward, Institute of Orthopaedics and Traumatology, Rajiv Gandhi Government General Hospital, Chennai-03. The tool consisted of demographic data, clinical data and Inch tape measuring score. The tool was validated by experts in the Medical and Surgical Nursing field and Director in charge of Orthopaedics and Traumatology.

The Pilot study was conducted after getting formal permission from the Director and Emergency Orthopaedic and Traumatology, Ward In charge assistants at Rajiv Gandhi Government General Hospital, Chennai-3. Pilot study was conducted at Emergency Orthopaedic and Traumatology Ward,at Rajiv Gandhi Government General Hospital, Chennai-03 for 5 days before conducting the actual main study. It was to check the feasibility and use of the instrument and to see whether any modifications are needed to be done before actual implementation of the study. Totally 10 clients have been selected, among that 5 were allotted to the experimental group and 5 were allotted to the control group. Specific nursing interventions were given to the experimental group using this tool and routine care was given to the control group clients by the staff nurses. Analysis of the study shows the positive effects of specific nursing interventions when compared to control group. The study was

practically feasible for the investigator. The samples who were selected and observed for Pilot study were not included in the main study.

The main study was conducted from the period of 15.07.2015to 15.08.2015, in the department of Emergency Orthopaedic and Traumatology Ward, Rajiv Gandhi Government General Hospital, Chennai-3 among 60 acute musculoskeletal injured clients. Simple random sampling-lottery method was adopted. The data collected was analyzed using both descriptive and inferential statistics.

6.2 MAJOR FINDINGS OF THE STUDY

- Majority (43.3%) of the samples were between the age group of 21- 30 years in the control group and (40.0%) in the experimental group.
- Majority (56.7%) of them were male in experimental group and (43.3%) were female in control group.
- Majority (50%) of the samples have completed primary education in experimental group and(46.7%) have completed their higher education in control group.
- Majority (63.3%) of them were Unemployed in experimental group and(43.3%) in control group.
- Majority (46.7%) of them have had income at the range of < 5000-10,000 in experimental and (46.7%) have had income at the range of 10000-15000 in control group.
- Majority (60%) of them are married in experimental group and(46.7%) in control group.
- Majority (76.7%) belongs to Hindu religion in experimental and (90.0%) control groups.
- Majority (56.7%) of them belongs to 2-3 hours duration of injury in experimental group and (76.7%) in control group.
- Majority (80%) of the samples were diagnosed as RTA in control group and (70%) in experimental group.

 Majority (76.7%) of them were injured in lower extremity in control group and (76.7%) in experimental group.

Majority (40.0%) of them were in 3 cms 0f swelling in experimental group, whereas (46.7%) of them were in control group in pre test swelling score.

 Majority (16.7) of them were no swelling, (66.7%) of them were 1-2cms of swelling in experimental group and (46.7%) were in 3-4 cms of swelling in control group in post test swelling score.

The results showed that there was a significant difference between experimental and control groups on pre test and post test swelling score. Majority (65.1%) of them improved well in the experimental group, where as only 16.9% improved in the control group. Statistical significance (P=0.001) was calculated using student independent t-test and chi-square test.

The association between subject's age and sex in demographic variable and duration of injury, injured site in the clinical variables showed significant association with reduction of swelling score in both experimental and control group. Statistical significance was analyzed using Pearson chi square and student's Independent "t" test.

6.3 IMPLICATIONS OF THE STUDY

The investigator had drawn the following implications for the study, which are necessary in the field of Nursing Practice, Nursing Education, Nursing Administration and Nursing Research.

NURSING PRACTICE

 Nurses play a vital role in trauma, inflammation and infection management, since most of the clients are having increased rate of acute musculoskeletal injuries.

 Nurses must have adequate knowledge regarding other non pharmacological swelling management like Ice cold application which is cost effective.

- Nurses should possess the skill of assessing the patient swelling level using Inch tape measuring scale especially in the Emergency wards, most of the clients were having severe intolerable pain.
- Specific management like Ice cold application may be given in order to reduce swelling and improve patient's comfort.
- Ice cold application can also be introduced as a policy for non Pharmacotherapy management.

NURSING EDUCATION

- Nurses must have adequate knowledge regarding Ice cold application, its indication and contraindication on swelling management, the physiology of Ice cold application before implementing on the clients.
- Nursing students should be exposed to clinical areas and learn regarding these interventions. The basic nursing curriculum must be modified to adapt to this internationally proved interventions.

NURSING ADMINISTRATION

- The nurse administrator must supervise the staff nurses and identify the problem faced by them and help them to find out solutions for that particular problem.
- Nurse administrators play a vital role in updating the knowledge level of staff nurses by arranging for In-service Education Programmes and conferences.
- Nurse administrators must allocate resources for conducting various staff development programme and should provide opportunity for the nurses to attend national and international conferences.

NURSING RESEARCH

- Nursing research plays a vital role in the clinical practice. Nurse researcher should encourage clinical nurse to conduct various research activities in their concerned field and motivate them to apply the findings and results in the clinical settings.

 Nurse researcher must make arrangement to make use of available resources and guidance and constant support for the clinical nurse to undertake research activities on Ice cold application.

 The study findings should be analyzed for its reliability, feasibility and its significance and the results should be disseminated to others.

6.4 RESEARCH LIMITATIONS OF THE STUDY

 The investigator had to store ice in air tight ice box as it was difficult to get ice cubes whenever required.

6.5 RECOMMENDATIONS

The investigator recommends the following for further research.

 Thesame study can be conducted in different settings

 The study can be replicated with large sample size to generalize the findings.

 The study can be conducted including other specific nursing interventions.

 The study can be conducted with other intervention of swelling management to reduce the level of swelling.

 The study can be conducted to assess the knowledge and practice of the nurses regarding application of Ice cold application on swelling management.

6.6 CONCLUSION

The present study assessed the effectiveness of Ice cold application among acute musculoskeletal injured clients admitted in Emergency Orthopaedic and Traumatology Ward. The results revealed that Ice cold application had a significant effect on the reduction swelling score which was statistically significant in the experimental group.

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ICE COLD APPLICATION PROCEDURE

Ice box with cover containing

- Ice cubes

Preparation of the patient

- Inform the patient about the procedure
- Screen the patient
- Place the patient in comfortable position
- Place the mackintosh under the needed part of the patient
- Place the thin cloth over the swelling area

Procedure

- Wash hands
- take 14-15ice cubes in a closed polythene cover with help of ice pickers..
- Apply the ice bag to the part for 20-30 minutes
- Stop the ice cold application after the stated time.
- Dry the part gently and observe for discoloration or numbness.

After care

- Make the patient comfortable
- Un screen the patient and clean the area
- Record the treatment with date and time.

SWELLING OBSERVATION TOOL:

S.NO	Date& Time	Patient's Details	Site of injury	Measurement of swelling before Ice Cold Application	Duration of Ice Cold Application	Measurement of swelling after Ice Cold Application	Remarks

STRUCTURED INTERVIEW SCHEDULE
Section-A

Demographic Variables

1) Age in Years
   a) 21-30 years ☐
   b) 31-40 years ☐
   c) 41-50 years ☐
   d) 51-60 years ☐

2) Sex
   a) Male ☐
   b) Female ☐

3) Education Status
   a) Uneducated ☐
   b) Primary Education ☐
   c) Higher Secondary ☐
   d) Graduate ☐

4) Occupation
   a) Professional ☐
   b) Business ☐
   c) Skilled Work ☐
   d) Unemployed ☐

5) Monthly Income
   a) <Rs.5000 ☐
   b) Rs.5001 to Rs.10000 ☐
   c) Rs.10001 to Rs.15000 ☐
   d) > Rs.15000 ☐

6) Religion
   a) Hindu ☐
   b) Christian ☐
   c) Muslim ☐
   d) Others ☐

7) Marital Stats
   a) Unmarried ☐
   b) Married ☐
   c) Others ☐

8) Area of living location
   a) Urban ☐
   b) Semi Urban ☐
   c) Rural ☐

9) Dietary habits
   a) Vegetarian ☐
   b) Non-Vegetarian ☐

Section-B
Medical Related Information

1) Nature of Accident
   a) RTA ☐
   b) TTA ☐
   c) Sports Injury ☐
   d) Fall ☐
   e) Assault ☐

2) Site of Injury
   a) Uppre Extremity ☐
   b) Lower Extremity ☐

3) Duration of Injury
   a) 1-2 Hours ☐
   b) 2-3 Hours ☐
   c) > 3 Hours ☐

4) Any other systemic illness
   a) Yes ☐
   b) No ☐

   If Yes, Specify

   a) Hypertension ☐
   b) Diabetes Mellitus ☐
   c) Neuro & Vascular Problems ☐
   d) Others ☐

5) Duration of treatment taking for systemic illness
   a) Hypertension ☐
   b) Diabetes Mellitus ☐
   c) Neuro & Vascular Problems ☐
   d) Others ☐

6) Any previous history of musculoskeletal injuries

a) Yes ☐
b) No ☐

If yes, specify

a) Hairline Fracture ☐
b) Major Fracture ☐
c) Sprains ☐
d) Ligament Tear ☐

7) Any history of previous orthopaedic surgeries

a) Yes ☐
b) No ☐

If yes, specify …….

8) Measurement of swelling before ice cold application

a) 1-2 cms ☐
b) 2-3 cms ☐
c) 3-4 cms ☐
d) 5cms (or) > 5cm ☐

ஆராய்ச்சி தகவல் தாள்

ஆராய்ச்சி தலைப்பு : உடனடி எலும்பு திசு காயத்தினால் ஏற்படும் வீக்கத்தை பனிக்கட்டி ஒத்தடத்தின் மூலம் குறைத்தல்.

ஆய்வாளர் பெயர் : **ப. அனிதா**

பங்கேற்பாளர் பெயர் :
தேதி :
வயது/பால்

ஆய்வாளர் மேற்கொள்ளும் ஆராய்ச்சியில் பங்கேற்க யாருடைய கட்டாயமுமின்றி முழுமனதுடனும் சம்மதிக்கலாம். இதில் பங்கேற்பதன் நோக்கம். இந்த ஆராய்ச்சியில் தகவல்களை தெரிந்து கொள்வதற்காகவும். அதனை பயன்படுத்துவதற்காக மட்டும் தான்.

இந்த ஆராய்ச்சியின் நோக்கம், உடனடி எலும்பு திசு காயத்தினால் ஏற்படும் வீக்கத்தை பனிக்கட்டி ஒத்தடத்தின் மூலம் குறைத்தல் ஆகும்.

ஆராய்ச்சி மேற்க்கொள்ளும் முறை

இந்த ஆராய்ச்சியில் ஆய்வாளர் தயார் செய்த கேள்வி மூலம், உடனடி எலும்பு திசு காயபட்டவற்களுக்கு பனிக்கட்டி ஒத்தடத்ததிற்கு முன்பும் மற்றும் பனிக்கட்டி ஒத்தடத்ததிற்கு பின்பும் அவருடைய காயத்தின் வீக்கம் குறைவதை அறியலாம்.

இதனால் ஆய்வாளருக்கான பயன்

இந்த ஆய்விற்க்குபின் உடனடி எலும்பு திசு காயத்தினால் ஏற்படும் வீக்கத்தை பனிக்கட்டி ஒத்தடத்தின் மூலம் குறைத்தலின் தாக்கத்தினை அறியலாம்.

இதனால் பங்கேற்பாளருக்கான பயன்

இந்த ஆய்வு பனிக்கட்டி ஒத்தடத்தின் நல் விளைவுகளை அறிந்து கொள்ள உதவுகிறது.இந்த ஆராய்ச்சியில் பங்கேற்க விருப்பம் இல்லை என்றால் உங்களின் முழுமனதுடன் நீங்கள் இந்த ஆராய்ச்சியில் இருந்து விலகி கொள்ளலாம் என்பதை தெரிவிக்கிறேன்.

இந்த ஆராய்ச்சியில் உங்களின் மருத்துவதகவல்களை பாதுகாப்பாக வைத்துகொள்கிறேன் என்பதை தெரிவிக்கிறேன்.

இந்த ஆராய்ச்சியின் தகவல்களை வெளியிடும் போது, உங்களை பற்றிய அடையாளங்கள் வெளிவராது என்பதை உறுதி கூறுகிறேன்.

ஆய்வாளர் கையொப்பம் பங்கேற்பாளர் கையொப்பம்

தேதி தேதி

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

EC Reg No.ECR/270/Inst./TN/2013
Telephone No. 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Mrs. P.ANITHA,
M.Sc., (Nursing),
College of Nursing
Madras Medical College,
Chennai – 600 003.

Dear Mrs. P.ANITHA,

The Institutional Ethics Committee has considered your request and approved your study titled **A STUDY TO ASSESS THE EFFECTIVENESS OF ICE COLD APPLICATION IN REDUCTION OF SWELLING PRIOR TO PLASTER OF PARIS MANAGEMENT AMONG PATIENTS WITH ACUTE MUSCULOSKELETAL INJURIES ADMITTED IN EMERGENCY ORTHOPAEDICS AND TRAUMATOLOGY WARD AT RAJIV GANDHI GOVERNMENT GENERAL HOSPITAL, CHENNAI. No.40102014.**

The following members of Ethics Committee were present in the meeting held on 21.10.2014 conducted at Madras Medical College, Chennai-3.

1. Dr.C.Rajendran, M.D.,	: Chairperson
2. Dr.R.Vimala, M.D., Dean, MMC, Ch-3	: Deputy Chairperson
3. Prof.B.Kalaiselvi, M.D., Vice-Principal, MMC, Ch-3	: Member Secretary
4. Prof.R.Nandhini, M.D., Inst.of Pharmacology, MMC	: Member
5. Prof.K.Ramadevi, Director i/c, Inst.of Biochemistry, MMC	: Member
6. Prof.Saraswathy, M.D., Director, Pathology, MMC, Ch-3	: Member
7. Prof.S.G.Sivachidambaram, M.D., Director i/c, Inst.of Internal Medicine, MMC	: Member
8. Dr.Raghumani, M.S., Professor of Surgery, MMC	: Member
9. Thiru S.Rameshkumar, Administrative Officer	: Lay Person
10. Thiru S.Govindasamy, B.A., B.L.,	: Lawyer
11. Tmt.Arnold Saulina, M.A., MSW.,	: Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

CERTIFICATE OF ENGLISH EDITING

TO WHOM SO EVER IT MAY CONCERN

This is to certify that the dissertation work **"A STUDY TO ASSESS THE EFFECTIVENESS OF ICE COLD APPLICATION IN THE REDUCTION OF SWELLING PRIOR TO PLASTER OF PARIS MANAGEMENT IN ACUTE MUSCULOSKELETAL INJURIES AMONG PATIENTS ADMITTED IN EMERGENCY ORTHOPAEDIC AND TRAUMATOLOGY WARD AT RAJIV GANDHI GOVERNMENT GENERAL HOSPITAL, CHENNAI"** done by Mrs. P.ANITHA, M.Sc (N) II-year student, College of Nursing, Madras Medical College, Chennai, is edited for English language appropriateness.

SIGNATURE : Poornima.M, M.A, B.Ed, M.phil,

DESIGNATION : English Teacher

SEAL : Shanthinikethan Matriculation
Higher Secondary School
2nd Main Road, Sembakkam,
Chennai - 600 073.

CERTIFICATE FOR CONTENT VALIDITY

This is to certify that a tool prepared by , **Mrs. P. Anitha** studying M.Sc.Nursing II year,College of Nursing, Madras Medical College, undertaking a research study on **"A STUDY TO ASSESS THE EFFECTIVENESS OF ICE COLD APPLICATION TO REDUCE SWELLING PRIOR TO PLASTER OF PARIS MANAGEMENT IN ACUTE MUSCULOSKELETAL INJURIES AMONG PATIENTS ADMITTED IN EMERGENCY ORTHOPAEDIC WARD AT RAJIV GANDHI GOVERNMENT GENERAL HOSPITAL, CHENNAI-3",** has been validated by me and is found to be valid up to date and she can proceed with this tool to conduct the main study.

PRINCIPAL
MADHA COLLEGE OF NURSING
MADHA NAGAR, KUNDRATHUR,
CHENNAI - 600 069
PHONE : 24780736

SIGNATURE WITH SEAL

Name : DR. TAMILARASI. B

Designation : PRINCIPAL

Date : 15.07.2015

Place : CHENNAI.

Seal :

MADHA COLLEGE OF NURSING
15 JUL 2015
CHENNAI - 600 069

CERTIFICATE FOR CONTENT VALIDITY

This is to certify that a tool prepared by , **Mrs. P. Anitha** studying M.Sc.Nursing II year,College of Nursing, Madras Medical College, undertaking a research study on **"A STUDY TO ASSESS THE EFFECTIVENESS OF ICE COLD APPLICATION TO REDUCE SWELLING PRIOR TO PLASTER OF PARIS MANAGEMENT IN ACUTE MUSCULOSKELETAL INJURIES AMONG PATIENTS ADMITTED IN EMERGENCY ORTHOPAEDIC WARD AT RAJIV GANDHI GOVERNMENT GENERAL HOSPITAL, CHENNAI-3",** has been validated by me and is found to be valid up to date and she can proceed with this tool to conduct the main study.

14/7/15

SIGNATURE WITH SEAL

Dr.N.Deen M Ismail
Prof. Of Ortho RGGH&MMC

Name : Dr. N. Deen M. Ismail

Designation : Director Incharge

Date : 14.07.15.

Place : Chennai-3

Seal :

INSTITUTE OF ORTHOPAEDIC & TRAUMATOLOGY * GOVT. GENERAL HOSPITAL * CHENNAI
DATE: 14.7.15

From

Mrs. P. Anitha,
M.Sc(Nursing) II year,
College of Nursing,
Madras Medical College,
Chennai -03.

To

The Director,
Institute of Orthopedics and Traumatology,
Rajiv Gandhi Government General Hospital
Chennai -03.

Through Proper Channel,

Respected Sir/Madam,

Sub: Requesting Permission to conduct a Research study-reg

I, **Mrs. P. Anitha,** studying M.Sc. Nursing II year ,College of Nursing, Madras Medical college, request you to kindly grant me permission for the study proposed to conduct on the topic **"A STUDY TO ASSESS THE EFFECTIVENESS OF ICE COLD APPLICATION TO REDUCE SWELLING PRIOR TO PLASTER OF PARIS MANAGEMENT IN ACUTE MUSCULOSKELETAL INJURIES AMONG PATIENTS ADMITTED IN EMERGENCY ORTHOPAEDIC WARD AT RAJIV GANDHI GOVERNMENT GENERAL HOSPITAL, CHENNAI-3."** to fulfill the requirement of data collection. I assure you that it will not interfere with routine activities of the study settings.

Thanking you,

Yours sincerely,
P. Anitha
(P. Anitha)

Date: 01.07.2015
Place: Chennai-03

INSTITUTE OF ORTHOPAEDIC & TRAUMATOLOGY * GOVT. GENERAL HOSPITAL * DATE : 7/7/15 CHENNAI

Permitted
7/7/15
Dr.N.Deen M Ismail
Prof. Of Ortho RGGH&MMC